British Orthopaedic Association

PATRON: H.R.H. THE PRINCE OF WALES

THE CARE OF PATIENTS WITH FRAGILITY FRACTURE

Published by the British Orthopaedic Association September 2007

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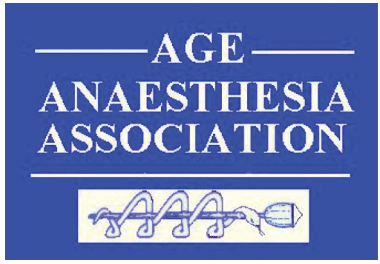

Age Anaesthesia Association

Faculty of Public Health

National Osteoporosis Society

Royal College of Nursing

Society for Endocrinology

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The Forum of the Royal Colleges of Surgeons and Specialist Surgical Associations of Great Britain and Ireland.

Contents

Foreword

Fragility fractures and their care are a challenge to our health care system and our society. Already in the UK around 300,000 patients with such fractures present each year, and current projections indicate that numbers of hip fracture patients – whose care is the central challenge our trauma units now face – will double by 2050.

The costs of this epidemic are great, in human as well as in economic terms, and much of our current care is sub-optimal. Osteoporosis is under-diagnosed and under-treated. Fracture services often fail to respond to the true complexity of their older patients' needs – for detailed medical and rehabilitation care as well as surgery. Secondary prevention of fractures is widely neglected. The scope for improving both the quality and cost-effectiveness of fragility fracture care is great, and for many services there is a long way to go.

But there are now substantial grounds for optimism, mainly in the many collaborative developments in the care of fragility fractures in recent years – many of which have originated here in the UK: perhaps most notably when a visionary orthopaedic surgeon, Michael Devas, and his equally innovative geriatrician colleague, Bobby Irvine, began working together in Hastings in the 1960s.

Today, in many UK centres, orthogeriatricians work alongside their surgical colleagues and recent training initiatives that bring together junior doctors from both specialties have been enthusiastically received. Collaborative audit of hip fracture is another UK success, now being extended and systematised via the BOA and BGS-sponsored National Hip Fracture Database (NHFD).

And as we begin to work better together, the evidence base for what we do for our patients is steadily growing. In pre-operative care, surgery, medical care, rehabilitation and secondary prevention new knowledge is emerging – though we must recognise that there are still gaps. This Blue Book seeks to summarise in concise form what we know from the evidence and also what we can for now know only as current best practice.

'Areas for further research' are therefore highlighted, and we believe that many of these can be addressed collaboratively by clinicians through the NHFD which – as well as benchmarking care and allowing trauma units to monitor their case-mix, care and outcomes – offers the possibility of large-scale multi-centre research on the many important 'known unknowns' of hip fracture.

Both the Blue Book and the NHFD are collaborative ventures, actively supported not only by orthopaedic surgeons and physicians in geriatric medicine but, as the logos of the endorsing organisations demonstrate, by nurses, anaesthetists, public health physicians, endocrinologists and the relevant national charity, the National Osteoporosis Society.

We believe that, together, the Blue Book and the NHFD not only symbolise the new collaborative approach to fragility fractures but offer practical help on how to make it work best for our patients: with evidence-based care recommendations, standards, service models, and the stimulus that audit offers in the continuing improvement of care.

John Getty
President
British Orthopaedic Association

Peter Crome
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September 2007

Executive Summary

General

- This revised edition of the Blue Book is sponsored by the British Orthopaedic Association and the British Geriatrics Society and seeks to summarise current best practice in the care and secondary prevention of fragility fractures.
- Together with the web-based National Hip Fracture Database, the Blue Book offers guidance, standards of care, and feedback on care and outcomes, thus allowing trauma units to benchmark and improve their management of the most serious common osteoporotic injury.

Osteoporosis – a new epidemic

- Osteoporosis is the most common disease of bone and its incidence is rising rapidly as the population ages. Though treatable, it is often left untreated.
- Organisation of the relevant services is poor, with little recognition of the nature of osteoporosis as a long-term condition.
- Better coordinated services – offering early diagnosis and bone protection, optimal fracture care and secondary prevention – would improve quality of life for patients and reduce the burden on services of fracture care.

Fragility fractures in an ageing society

- Over 300,000 patients present to hospitals in the UK with fragility fractures each year, with medical and social care costs – most of which relate to hip fracture care – at around £2 billion.
- The care and rehabilitation of patients with hip fracture is the central challenge for UK trauma services, but the quality and cost effectiveness of such care varies considerably across the country.
- Current projections suggest that, in the UK, hip fracture incidence will rise from the current figure of c. 70,000 per year to 91,500 in 2015 and 101,000 in 2020.

Improving fracture services

- The evidence-base for hip fracture care is improving rapidly and, in general terms, shows that prompt, effective, multidisciplinary management can improve quality and at the same time reduce costs.

  Key elements of good care include:
  - Prompt admission to orthopaedic care
  - Rapid comprehensive assessment – medical, surgical and anaesthetic
  - Minimal delay to surgery
  - Accurate and well-performed surgery
  - Prompt mobilisation
  - Early multidisciplinary rehabilitation

- Early supported discharge and ongoing community rehabilitation
- Secondary prevention, combining bone protection and falls assessment

- Many elderly fracture patients are frail and have complex medical problems. Their needs for specialist medical care and early rehabilitation are best addressed when an orthogeriatrician – a care of the elderly physician with an interest in fracture care – is fully integrated in the work of the fracture service.

  Advantages of such collaborative care include:
  - Overall improvement in standards of medical care
  - Minimal delay to surgery caused by medical problems
  - Improved management of perioperative medical complications
  - Better coordination of multidisciplinary team work
  - Improved communication with patients and relatives
  - Reduction in adverse events

Secondary prevention of fragility fractures

- Sustaining a fragility fracture at least doubles the risk of future fractures and, although secondary prevention in the form of bone protection and falls assessment is of proven value, only a minority of patients currently benefit from such interventions.
- Older patients presenting with fractures should be offered assessment for osteoporosis by axial bone densitometry. In patients with osteoporosis, the risk of further fracture can be halved by anti-resorptive therapy.
- Most fractures result from a fall, and interventions to reduce the risk of falls can be effective in preventing further such events. However, fewer than half of patients currently admitted with fracture are routinely offered such an assessment.
- Ideally, comprehensive secondary prevention should consist of osteoporosis assessment and treatment together with a falls risk assessment, in a 'one-stop shop' setting. The challenge of organising such services and integrating them across acute and primary care is considerable.
- A Fracture Liaison Service, delivered by a Nurse Specialist, is a proven approach to the identification, assessment and treatment of fracture risk, and this model should be considered in all units.

Using audit, standards and feedback to improve care and secondary prevention

- The National Hip Fracture Database (NHFD) is a web-based audit that builds on the work of a number of large scale hip fracture audits across the UK and is supported by the National Clinical Audit Support Programme (NCASP). Its aim is to promote best practice in the care and secondary prevention of hip fracture. NHFD will:

  - Collect data on patient casemix, care, outcomes and secondary prevention

- Allow casemix-adjusted outcome assessment to promote transparency of inter-hospital comparisons
- Enable hospitals to compare care and outcomes against national benchmarks and quality standards
- Monitor performance over time
- Measure the impact of changes in clinical care and service organisation
- Support large-scale research on aspects of hip fracture care, through the use of 'sprint audits' and casemix-adjusted outcomes

Six standards for hip fracture care

These standards reflect good practice at key stages of hip fracture care. Widespread compliance with them would improve the quality and outcomes of care and also reduce its costs. The rationale for them is set out in the Blue Book, and compliance – and progress towards compliance – can be continuously monitored by participation in NHFD.

1. All patients with hip fracture should be admitted to an acute orthopaedic ward within 4 hours of presentation

2. All patients with hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours

3. All patients with hip fracture should be assessed and cared for with a view to minimising their risk of developing a pressure ulcer

4. All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support from the time of admission

5. All patients presenting with fragility fracture should be assessed to determine their need for antiresorptive therapy to prevent future osteoporotic fractures

6. All patients presenting with a fragility fracture following a fall should be offered multidisciplinary assessment and intervention to prevent future falls

INTRODUCTION

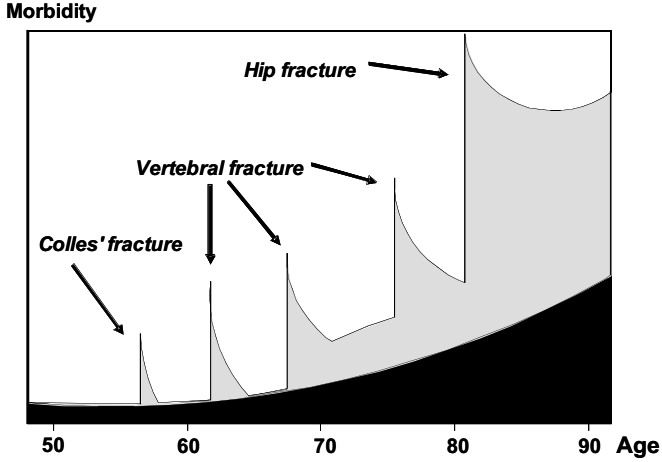
Osteoporosis: a long term condition and a new epidemic

> *"Osteoporosis is the most common bone disease in humans and affects both men and women. The clinical and public health implications of the disease are substantial because of the mortality, morbidity and cost of medical care associated with osteoporotic fractures."*[1]

Osteoporosis is a long-term condition. Its onset is asymptomatic and its duration thereafter lifelong; and as a result of mass survival into old age it is becoming much commoner. As a long-term condition it is treatable, but usually left untreated. Its exacerbations – in the form of fragility fractures – are a major and rapidly increasing cause of acute morbidity.

At its worst, the osteoporotic life-experience – in diagrammatic form below – can be one of remorseless progression: from Colles' fracture and minor and perhaps minimally symptomatic vertebral fractures to the major distress, dependency and disability of hip fracture. Health care costs are high and rising with rising fracture incidence. The human costs – in terms of pain, deformity and loss of independence – can be truly harrowing.

Figure 1. Fracture and quality of life over the life span



(Adapted from *J Endo Investigation* 1999;22(8):583-588 Kanis JA & Johnell O)

Yet our current models of care for osteoporosis are frankly inadequate. They fail to recognise osteoporosis as a long-term condition requiring long-term management. They fail to coordinate key elements of its care: case-finding for those at high risk,

falls prevention, bone protection, fracture surgery and rehabilitation. The result is sub-optimal patient care – disjointed, broadly ineffective and unnecessarily costly – widely across the UK.

With a radical shift towards long-term management of osteoporosis, our services would look very different. Primary and secondary care would work together, offering case-finding and far greater patient-centredness. 'One-stop shop' care would include falls assessment and bone quality assessment. Wider and more effective use of evidence-based bone protection would reduce fracture incidence.[2] Better coordinated, more effective osteoporotic fracture surgery and rehabilitation services would deliver prompt, high quality care at lower cost. The disease burden would be reduced and its costs contained.

There is a long way to go, but already we have more than enough evidence on how we should begin.

The challenge: fragility fractures in an ageing society

Each year in the UK around 310,000 patients, the majority of whom are old, present to hospital with fractures.[3] Around a quarter of these are fractures of the hip, the most devastating common fracture, and one that typically results from a fall in an older person.

The ageing of the UK population and a rising age-specific incidence mean that hip fractures have risen by 2% per annum from 1999 to 2006.[4] Projections suggest that, if this continues, numbers will rise from the current figure of c. 70,000 to 91,500 in 2015 and 101,000 in 2020.

Care of fragility fractures is expensive. Direct medical costs to the UK healthcare economy have been estimated at £1.8 billion in 2000, with the potential to increase to £2.2 billion by 2020[5] and with most of these costs relating to hip fracture care.

A reduction in fracture risk by effective secondary prevention, together with more efficient fracture care, may serve to moderate both incidence and overall costs, but the organisational and financial implications of fragility fractures in the coming decades will still be formidable.

Patients with fractured neck of femur are almost invariably admitted immediately to hospital, and the care of this injury is now established as the central challenge of the current epidemic of osteoporotic fractures. Currently service structures, care and outcomes for hip fracture vary across the UK. However, there is a rapidly growing body of good evidence on how the injury should be managed, and optimising its care more widely is now an urgent priority.

Many other types of osteoporotic fracture – principally those of humerus, distal

radius, pelvis, tibia, and ankle – lead to the admission of older patients to surgical care; but in relation to hip fracture they are individually both less numerous and generally less severe. High quality evidence on their optimal care is less clear-cut than that for hip fracture, but services that are structured and staffed to provide good surgical, medical, nursing and rehabilitation care for hip fracture patients will be capable of providing good care for patients with all of these 'other' fractures too. For that reason too, much of what follows refers to the care of patients with hip fracture.

Care and rehabilitation of patients with hip fracture is the central challenge for trauma services; and those that can provide good care for these patients will cope well with the range of other fragility fractures encountered.

Hip fracture risk is multifactorial and reflects general frailty and falls risk as much as it does bone fragility, with people living in residential and nursing homes at three times the risk of those in the general population[6], and around a quarter of patients with hip fracture being admitted from institutional care.

Patient frailty is reflected in the outcome of hip fracture – 10% of people die in hospital within a month, and at one year around one third are dead. The fracture is responsible for less than half of deaths[7], but the patients and families will often identify the hip fracture as playing the central part in a final illness.

Hip fracture seriously damages quality of life for survivors, of whom only half will return to their previous level of independence. Most can expect at least some long-term hip discomfort, and half will suffer deterioration in their walking ability, such that they will need an additional walking aid or physical help with mobility. 10-20% of people admitted from home will move to residential or nursing care following hip fracture. Such a move is greatly feared by patients, and 80% of elderly women would prefer to die rather than have to move to a nursing home as a result of losing their independence following a 'bad hip fracture'[8].

Length of hospital stay varies considerably between units: in the acute ward averaging between two and three weeks; and with overall hospital stay averaging as much as five weeks. Differences in length of stay largely reflect differences in service structures and provision, such as in early rehabilitation, the availability of downstream beds, and of community rehabilitation services.

Length of stay accounts for the majority of overall hospital costs, which have been estimated to be between £5,600[9] and £12,000[10] per case. After discharge from hospital, the cost of complex home and institutional care for people who make a poor recovery is very high, with average additional costs for health and social aftercare of £13,000 in the first two years.

This profile of the mortality, morbidity, loss of independence and the resulting clinical and financial impact on health and social services from hip fracture alone is

daunting and emphasises the need for care based on the best available evidence.

This edition of the Blue Book and the new National Hip Fracture Database (NHFD) both seek to promote evidence-based care of hip fracture. Together they offer the synergy of evidence-based guidance on care and continuous audit in participating units. And together they aim to improve the quality and cost-effectiveness of the care of this important and increasingly common injury; and in the longer term to reduce its incidence by the promotion of routine secondary prevention following fragility fracture.

Our response to this challenge

The epidemic of fragility fractures poses an enormous challenge to our society and, especially, to the trauma and orthopaedic units that now face being overwhelmed by it. So it is vital that those who commission such services, and the managers and clinicians who provide them, are made aware of the scale of this challenge and armed with an understanding of how best to meet it.

They must respond not only to current pressures, but should plan services to cope with future demand, and in addition implement effective secondary prevention in order to minimise this demand. Already there are grounds for optimism. One of the more reassuring messages now emerging is that quality and cost of care are not in conflict: care that is prompt and effective – minimising delay, maximising recovery, and promoting early return home – is not only better care, but is also less costly.

> Looking after hip fracture patients well is a lot cheaper than looking after them badly.

This booklet sets out how we can meet the challenge of osteoporotic fractures both now and in the coming decades. It is hoped that clinical teams (orthopaedic surgeons, geriatricians, nursing staff and allied health professionals) will apply its principles in their own units and be supported in the provision of evidence-based developments in multidisciplinary care; that their patients will have access to effective secondary prevention to reduce risks of further fracture; and that, by participating in the National Hip Fracture Database, clinical teams will have the means to monitor and improve the care they provide.

Three key elements of a strategy for osteoporotic fractures

1. High quality fracture care – delivered through coordinated multidisciplinary teamwork

Osteoporotic fracture patients – and especially hip fracture patients – have complex medical, surgical and rehabilitation needs. A strong sense of urgency is vital in their

care. Any delay in resuscitation, transfer to ward, appropriate investigation, and listing for prompt day-time surgical fixation is likely to harm the patient and add to the cost of care. Effective rehabilitation, too, is urgent, both in promoting independence and return home and in minimising cost by reducing length of stay.

High quality care of hip fracture patients requires systematic, well-coordinated multidisciplinary teamwork, and this is best achieved by senior personnel in the relevant disciplines assuming leadership roles and developing locally systems that support good care. These individuals should ideally be consultants or equivalent; and each organisation – acute care, rehabilitation care and primary care – involved in the management of hip fracture patients should encourage the development of these 'champions'.

Each acute trust must have a surgeon, physician, anaesthetist and specialist nurses with a committed and continuing professional interest in these patients. Joint leadership will ensure consistency of policies on clinical management, so that all unnecessary delays in care are eliminated.

The surgical challenges are formidable, since the poor mechanical properties of osteoporotic bone can make fracture fixation extremely difficult. Implants that work well in younger, stronger bone are often inadequate. Distal femur, proximal humerus, and many other fractures can present considerable surgical problems.

The surgical care of the sometimes difficult and complex fractures associated with osteoporosis should therefore not be delegated to the inexperienced junior surgeon. These fractures require timely and expert fixation with the most appropriate implant; the frailty of the patients dictates that surgery should be neither prolonged nor unduly traumatic.

Coordinated multidisciplinary fracture services for fragility fracture patients promote good quality of care and reduce the costs of that care.

Optimal medical, anaesthetic, surgical and nursing care will minimise pain and dependency, promote more rapid recovery and earlier rehabilitation, and facilitate progress towards home. Overall effectiveness of surgery and rehabilitation is best achieved when the necessary multidisciplinary care is reliably organised and routinely available throughout the journey of care.

2. High quality secondary prevention of fragility fracture – ensured by providing bone protection and falls assessment

There is now a growing body of evidence on the effectiveness of secondary prevention using anti-resorptive drugs to improve bone quality. Evidence for the effectiveness of falls prevention interventions is also accumulating, yet both

approaches are currently underused. Effective secondary prevention must become an integral part of our strategy for fragility fractures.

Since the strongest predictor of a future fragility fracture is having had one already, any such fracture should trigger a determined attempt to prevent further fractures.

> Secondary prevention – currently under-used – is effective in reducing fragility fractures and should be an integral part of fracture care.

Any correctable tendency to bone fragility or to falls should be addressed, and osteoporosis management and falls prevention should be offered to all appropriate patients – those treated as outpatients as well as those admitted and treated operatively. Individual patient referrals are inefficient, and should be replaced by routine, proactive case finding. Again, systematic, well-coordinated teamwork reaching from acute to primary care is effective.

3. High quality information – using standards, audit and feedback to improve hip fracture care and secondary prevention

Hip fracture – as a common, well-defined and serious injury that is costly in both human and economic terms – is an ideal subject for clinical audit, and a number of large-scale regional and national audits have now been established. These have documented casemix, process and outcomes. They allow benchmarking of care and outcomes between participating hospitals and, within hospitals, can be used to monitor care processes, and to evaluate the impact of changes in clinical care and of service developments.

The growing evidence-base for optimal care can, together with audit, lead to an iterative process that allows the care provided to be matched by the audit against standards derived from sound evidence, and the impact of such care to be assessed in terms of its outcomes.

The Blue Book and the NHFD thus offer to participating Trauma Units the synergy between evidence-based care recommendations and audit-based continuous feedback and national benchmarking of key aspects of hip fracture care – such as time to surgery, type of surgery, rate of return home, and use of secondary prevention measures.

By knowing more about the care they provide, and how this compares with recommended standards and with the performance of other units across the UK, clinical teams will be in a far stronger position to monitor and improve that care.

Evidence-based care recommendations from the Blue Book, and continuous feedback on care now available from the web-based National Hip Fracture Database, can provide trauma services with:

- Standards of care
- Information on how standards are being met
- Evidence about care process and outcomes, and impact of clinical and service change
- Continuous benchmarking against national and regional data

The web-based Myocardial Infarction National Audit Project (MINAP) – on which the technical aspects of NHFD are modelled – provides an encouraging example.[11] A user-friendly means of uploading data, and the provision of immediate feedback and continuous benchmarking, have together led to major improvements in the speed, quality and outcomes of care after myocardial infarction.

Hip fracture care is clearly more complex than that for myocardial infarction, but the NHFD will undoubtedly bring a new transparency and higher profile to hip fracture care in the UK, and provide an important means of supporting its continuing improvement.

1. Improving fracture care – through coordinated multidisciplinary teamwork

This section, which – for reasons outlined above – takes the hip fracture patient as its focus, reviews the major issues that should be addressed in delivering hospital care that is both efficient and of high quality; and describes how service developments can ensure such care is reliably delivered.

1.1 Pre-operative assessment and care

Initial assessment

An elderly woman (most commonly in her 80s) falls after a trip or collapse, and presents with pain in the hip and inability to walk. Examination in the Accident and Emergency Department (AED) reveals a shortened and externally rotated limb with any attempt at moving the hip causing pain.

Diagnosis

The diagnosis is usually apparent on x-ray, but in 10-15% is missed or delayed[1]. Delay in diagnosis may result from a confused patient's failure to report a fall, or the admitting doctor's failure to elicit or react to this history.

Approximately 15% of fractures are undisplaced, and therefore produce no shortening or external rotation of the limb. Hip movements, although painful, may be possible and the patient may even be able to walk. The x-ray changes of an undisplaced fracture may be minimal. For about 1% of hip fractures the initial x-rays will appear to be completely normal.

Some experience is necessary in interpreting hip x-rays. The x-ray beam is not centred on the hip, and the leg is generally in external rotation, so the greater trochanter lies posterior to the femoral neck and obscures detail for this area. The limb should ideally be in 10° of internal rotation with the femoral neck at a right angle to the x-ray beam. A hip fracture can never be excluded without a lateral x-ray. The correct exposure of such films to ensure clarity of detail in the femoral neck may be difficult.

A further AP film centred on the hip may resolve uncertainty but additional investigations may be needed where there is clinical suspicion of a fracture in the absence of x-ray findings. An MRI scan is currently the investigation of choice. Alternatives are a multi-slice CT or an isotope bone scan – though the latter may become positive only after a few days.

Fast tracking to orthopaedic care
Many Accident and Emergency Departments have fast tracking policies for hip fracture to speed the patient's progress through the department. Admission is inevitable, and unnecessary delay will simply increase the risk of pressure sores, confusion and pain.

The following check-list should be completed in the AED:

- Diagnosis established
- Pressure relieving mattress used
- Patient assessed for other injuries and medical conditions
- Pain relief
- Routine bloods – FBC, U&E, group and save
- ECG
- Pre-operative chest x-ray (except in younger, fitter individuals)
- Immediate fluid resuscitation with intravenous saline

The patient should be transferred to a bed on the orthopaedic ward without further delay.

Standard 1

All patients with hip fracture should be admitted to an acute orthopaedic ward within 4 hours of presentation

NHFD – fields 1.04/1.05

Full clinical evaluation

Despite the difficulty in taking a reliable history in some patients, an attempt should always be made to find the cause of the fall. Falls are often described as being 'simple', but this is frequently not the case: many are multi-factorial and some have a cardiovascular basis.

While the patient's recollection of events may be inaccurate, the cause of the fall may still emerge if a witness was present and can be interviewed. The admitting orthopaedic doctor often has the best opportunity to review the circumstances of the fall while these are fresh in the mind of the patient and any accompanying witness.

Documentation of these details will be invaluable in identifying people who need further evaluation of an unexplained fall, and in prioritising the elements of secondary falls prevention later in their care (see Falls prevention – section 2 below, p.44). An alcohol history may elicit an explanation for both the fall and the presence of osteoporosis.

Hypotension is often an aetiological factor, exacerbated by medication such as

diuretics, beta-blockers and sedatives. The Parkinsonian patient is at particular risk due to postural instability and orthostatic hypotension. The diabetic patient is also prone to falls due to poor vision, peripheral and autonomic neuropathy and hypoglycaemia.

Not all fractures are due to osteoporosis. Hip fracture may be the first presentation of Pagetic or metastatic bone disease – when fracture may follow minimal trauma, with the fall resulting from the fracture rather than the other way round. Cancers that commonly metastasise to bone are those arising in bronchus, breast, kidney, and prostate. Haematological malignancies such as myeloma and lymphoma may also contribute.

Concurrent medical conditions should be noted and evaluated, and medication should be assessed and appropriate changes considered.

A full social history – with information on activities of daily living, type of dwelling and other family members at home, as well as the use of outside support agencies – helps to give a fuller picture of the patient and allows early assessment of rehabilitation needs and potential. Previous level of mobility should be ascertained and the use of walking aids documented.

Clinical evaluation includes:

- Cause(s) of fall
- Comorbidities and medication
- Previous function and support
- Cognitive status

Mental tests scores on admission are a useful baseline for monitoring peri-operative confusion, which is very common in older fracture patients; they also serve to identify individuals who may have difficulty in giving informed consent, and are in themselves a powerful indicator of outcome.

Pre-operative assessment

The complexity of most fragility fracture patients is compounded by comorbidities and polypharmacy. The priority is good initial medical assessment and review prior to surgery. Experienced anaesthetists and orthogeriatric physicians should work together to ensure that delays do not occur. Pre-operative assessment and optimisation must be a clinical priority but should not delay surgery.

An electrocardiogram will help to detect arrhythmias and coronary events that may have precipitated a fall. More complex assessments such as 24-hour ECG monitoring are inappropriate unless there are specific clinical indications of arrhythmia[2].

Blood loss from the fracture site can vary from a few millilitres for an undisplaced intracapsular fracture to over a litre for a multi-fragment or sub-trochanteric fracture.

All patients should have intravenous saline from the time of presentation to casualty, with the rate of infusion adjusted according to the estimated blood loss and degree of dehydration. A cannula of at least 18G should be inserted in a forearm or hand vein. The ante-cubital fossa should be avoided, as this site is associated with discomfort for the patient and recurrent position changes in order to allow the fluid to flow. Transfusion may be required as a haemoglobin fall of 2-3g/dl over the perioperative period can be anticipated in most patients.

Patients taking warfarin require careful preparation and surgery is best deferred until the INR is less than 1.5. Whether this should be hastened with the use of low dose vitamin K or fresh frozen plasma is currently uncertain, as there is an absence of relevant research.

Clopidogrel (Plavix) is a potent anti-platelet drug being used increasingly in acute coronary syndromes and stroke. Concerns over increased surgical bleeding mean that patients should stop clopidogrel 7 days before elective surgery. This is not practical in patients requiring urgent surgical treatment for a fracture and may increase the risk of coronary or cerebrovascular events. Thus, it may be necessary for surgeon, physician and anaesthetist to agree a compromise.

Prompt and safe surgery is essential to good hip fracture care and is ensured by good pre-operative assessment – using protocols agreed by orthogeriatrician, anaesthetist and surgeon

Management of medical concerns such as these is rendered more complex by the competing priorities of high quality medical management and the need for prompt fixation of the fracture – both of which are crucial to good outcome.

A further example of such dilemmas is the management of systolic heart murmurs. These are common in older people, but create a special problem in the hip fracture patient. The difficulty arises in distinguishing clinically between a benign murmur and one denoting significant aortic stenosis. The latter may be important in anaesthesia, and is a relative contraindication to a spinal technique.

The 2001 National Confidential Enquiry into Perioperative Deaths (NCEPOD) report[3] recommended echocardiographic assessment of all cardiac murmurs, but this is not always possible prior to urgent surgery. If an echo can be obtained without causing delay, the information may be useful. However, the absence of echocardiography should not lead to delays in fixing the fracture.

Whatever approach is taken to this and similar interdisciplinary clinical issues, the key to prompt and safe fracture fixation is close co-operation between orthogeriatric

physicians, surgeons and anaesthetists. In assessing fitness for anaesthesia it is imperative that decision-making is consistent and consultant-led. While concerns may be raised about the possible risks of proceeding to surgery without specific investigations, the well-documented risks of lengthening delay should never be forgotten.

It is important to note that, despite many studies and reviews, there remains considerable uncertainty on a fundamental aspect of hip fracture care – namely the choice of anaesthetic technique. A Cochrane review on the topic[4] noted that 'All trials had methodological flaws and many do not reflect current anaesthetic practice' and concluded 'Overall, there was insufficient evidence available from trials comparing regional versus general anaesthesia to rule out clinically important differences. Regional anaesthesia may reduce post-operative confusion but no conclusions can be drawn on mortality or other outcomes.'

Locally-developed and owned pre-operative policies, supported by senior surgeons, anaesthetists and orthogeriatricians working together in the Trauma Unit, will ensure prompt surgery, patient safety and efficiency – with benefits both to patient care and the smooth working of the unit.

Areas for Research

Many questions remain to be answered concerning the pre-operative management of fragility fractures/hip fracture. The following are some examples:

- Development and evaluation of evidence-based pre-operative protocols aiming to ensure patient safety and minimise delay
- Definition of criteria that are sufficiently important to justify delay in surgery – ie clinically relevant, and amenable to prompt pre-operative improvement
- Improving the evidence base for decisions about patients on warfarin, clopidogrel and other anti-platelet medications
- Improving the evidence base for choice of anaesthetic techniques; and for identification of best techniques for various risk groups

1.2 Surgical care of the fragility fracture patient

Osteoporotic fractures – general considerations

Osteoporosis not only makes fracture more likely; it also means that fractures are more likely to be comminuted – making anatomical reduction much harder. Osteoporosis also slows fracture healing and makes internal fixation more difficult. Fixations that have to be more durable – because healing is slower – must be achieved despite the poor bone quality. Reduced compressive strength makes screws more likely to 'toggle' – become loose by enlarging the hole in which they sit – and reduced shear strength makes it more likely that screws lose their grip and pull out.

> Obtaining secure fixation in osteoporotic bone is more difficult, but needs to be more durable because fracture healing takes longer than in normal bone

A twofold reduction in bone density gives rise to a fourfold decline in ultimate compressive strength, a loss which may be the most important factor in fixation failure in osteoporotic bone. Screw holding power also diminishes as cortical thickness decreases. Similar principles apply to the wires used in circular external fixators; and when an intramedullary nail is used to stabilise a fracture at the distal end of the femur it is exposed to large loads and risks breaking. From these examples it can be seen that the surgeon faces a number of challenges.

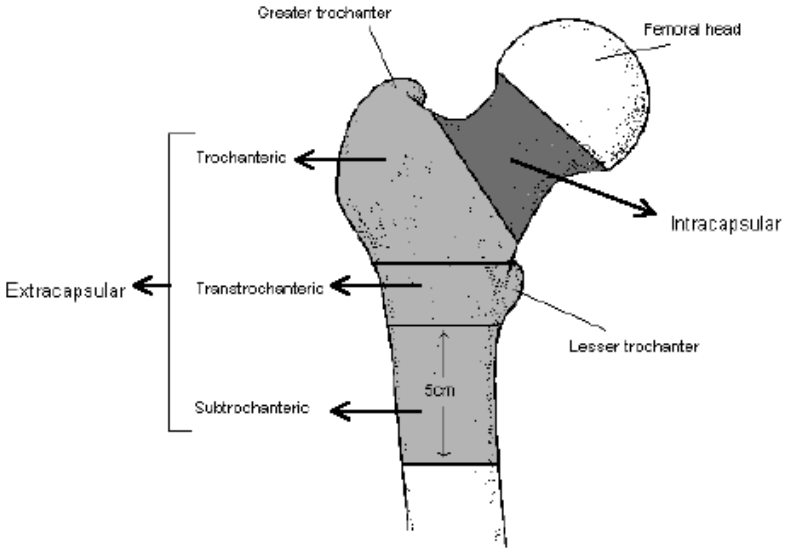
Despite these challenges, surgical stabilisation of fragile bone is the main goal of operative intervention, with consistently accurate reduction and secure fracture stabilisation allowing early movement the desired outcome. Obviously, such procedures should be performed only by a surgeon with the appropriate expertise; and the level of senior supervision should be high.

For patients receiving conservative treatment, attention to detail is important in obtaining the best results. Skill in applying casts and splints, and careful monitoring to ensure that skin problems are avoided, are essential.

Hip fracture and its surgical care

Classification

Hip fractures are classified according to where in the femur the fracture line is mainly located. A major portion of the blood supply to the femoral head enters along the line of the joint capsule's attachment; hence the importance, in terms of prognosis and management, of drawing a distinction between intracapsular and extracapsular fractures.



Intracapsular fractures include subcapital and basal fractures and may be displaced or undisplaced. Extracapsular fractures include basal, trochanteric and subtrochanteric fractures

Trochanteric fractures may be further subdivided into two part fractures, which are also termed stable fractures, and those that are comminuted or multi-fragmentary, which may be termed unstable fractures. Basal fractures are two part fractures in which the fracture line runs along the inter-trochanteric line, but are uncommon and best thought of as two part trochanteric fractures. Subtrochanteric fractures are those in which the fracture is predominantly in the 5cms of bone immediately distal to the lesser trochanter.

Conservative treatment

This is now only rarely practised, because an unfixed hip fracture causes continuing pain, loss of weight-bearing and very high levels of dependency. Non-union is common and length of stay high; and – not surprisingly – studies have indicated much improved outcomes for those treated operatively. Conservative treatment may thus be appropiate only in a few specific situations:

1. Where the patient‘s life expectancy is very short and the risks of surgery outweigh the benefits. However, even in those with a short life expectancy, surgery provides excellent pain relief and makes nursing care easier.

2. For those patients who present late with a fracture that shows signs of healing.

3. For the totally immobile patient. However, surgery does assist pain relief and makes nursing care easier, particulary if the patient uses the limb for standing during transfers.

4. For those who refuse surgery.

The usual treatment for all types of hip fracture is surgical. Conservative treatment is rarely indicated in developed countries.

Surgical treatment: general

Hip fracture patients present unique challenges. The common combination of frailty, medical illness, acute presentation, poor bone quality and urgent surgery brings substantial risk. Mortality at 30 days is quoted at 8-13%, and seems largely to reflect casemix. Attempts to reduce it have so far been disappointing, but a broad consensus on good practice – some of it supported by good evidence – is emerging.

All patients undergoing hip fracture surgery should receive antibiotic prophylaxis.

The aims of surgery are to control pain and promote early mobilisation; delay from admission to surgery causes distress to the patient and is associated with greater morbidity and mortality.

Standard 2

All patients with hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours

NHFD Fields 1.04 and 4.01

Even when operating time is minimised, the period during which the patient is vulnerable extends for several hours. It may be appropriate to use High Dependency Units for prolonged cardiovascular monitoring or the use of infusions of analgesics in selected cases

The risks of immobility in frail older patients are significant and so the aim should be to mobilise on the first day following accurately performed surgery. Full weight bearing is usually indicated.

Undisplaced intracapsular fractures

Internal fixation is recommended. This is a relatively minor surgical procedure and can be performed percutaneously. There are many different implants, the most frequently used being two or three parallel screws or a sliding hip screw. Post-

operatively, most patients recover quickly with hospital stays of 7-10 days. Arthroplasty is not appropriate, because of the increased surgical trauma and risk of post-operative complications.

Internal fixation is recommended for undisplaced intracapsular fractures

The most common complication is failure of the fracture to heal. This may manifest itself as displacement of the fracture, which can occur within days or weeks. The terms non-union, pseudarthrosis or delayed union are generally used for those fractures that fail to heal after a few months. Avascular necrosis or late segmental collapse refers to collapse of the weight bearing part of the femoral head due to insufficient blood supply. It normally occurs within one to two years of the fracture. Replacement arthroplasty is the usual treatment although, in younger patients, osteotomy or a re-vascularisation procedure may be used in an attempt to retain the femoral head.

Other complications of internal fixation include irritation caused by the lag screw backing out into the soft tissue laterally. The patient may complain of pain and inability to lie on that side or of clicking around the hip. There will be local tenderness over the implant. Treatment either involves removal of the lag screw or its replacement with a shorter one.

Displaced intracapsular fractures

Internal fixation of this fracture has advantages and disadvantages. The patient is able to retain the femoral head, and the lesser surgical trauma may reduce mortality and morbidity, wound haematoma and sepsis. However, it incurs a risk of non-union (20-33%), avascular necrosis (10-20%) and fracture around the implant (1-2%), and hence a need for re-operation of 20-36%.

The re-operation rate following internal fixation is 20-36%. Following arthroplasty it is 6-18%

For arthroplasty, the lower re-operation rate (6-18%) must be set against an increased risk of haematoma (2-5%), superficial (5-15%) and deep (3%) wound infection, dislocation (2-5%), periprosthetic fracture (1-3%), loosening (2-10%), and later acetabular wear (4-20%).

The main factor influencing choice of treatment is the risk of non-union. Factors that will increase this are delay from injury to fixation, pathological lesions of the bone such as tumour or Paget's disease, metabolic bone disease and rheumatoid arthritis.

For younger patients (aged less than about 65-70 years), in whom life expectancy may exceed that of an arthroplasty, reduction and fixation is the most appropriate

treatment. In addition, internal fixation may be used in the very frail elderly in whom the more extensive operation of hemiarthroplasty may be inappropriate.

Considerable controversy persists about the optimum choice of treatment for the frailer patient, such as one in whom physical or mental impairment precludes independent shopping. The Cochrane review on this topic[5] concludes that arthroplasty is a more reliable procedure, with a lower re-operation rate and a tendency towards better functional results.

If arthroplasty is chosen as the method of treatment, a partial hip replacement may be used, with only the femoral head being replaced (hemiarthroplasty). Alternatively, a total hip replacement may be used, in which the acetabular articular surface is also replaced.

Hemiarthroplasty is a lesser surgical procedure, has a lower risk of dislocation, and tends to be preferred to total hip arthroplasty for the frailer patient, but debate continues about the functional outcome and later requirement for revision surgery. The limited randomised trials to date have been summarised in a Cochrane review on this topic[5].

Total hip replacement may have a greater role to play than hitherto but studies involving greater numbers are required before clear guidance can be given. If used, it is recommended that it be confined to the physiologically younger, previously mobile, unconfused patient.

Arthroplasties may be either cemented or cementless (press fit). Cementing does add the possibility of additional operative problems and makes any subsequent revision procedure more difficult, and may not be indicated in the frailest and non-ambulatory. However, using cement is associated with a lower aseptic loosening rate, may also make the hip less painful and improves function. Accordingly, it should usually be preferred to a cementless technique[5].

Arthroplasties should usually be cemented

Progressively increasing pain or deteriorating mobility after an arthroplasty may be due to one of a number of complications. Loosening is reported in 2-30% of cases and is much more common after an uncemented implant. The incidence is lower for cemented prostheses and those patients with limited functional demands or life expectancy. Treatment is by revision arthroplasty if symptoms are sufficiently severe. Acetabular wear after hemiarthroplasty has a reported incidence of 5-50%, depending largely on the length of follow-up, and is strongly related to the activity of the patient. Treatment is again by revision arthroplasty.

Other complications of arthroplasty include periprosthetic fracture which occurs in 1-5% of patients, generally after another fall. Treatment may be conservative with bed

rest, bracing or traction. Alternatively, it may be surgical with either fixation of the fracture or revision arthroplasty, often using a more substantial implant.

Trochanteric fractures

A variety of devices are available for the treatment of this fracture. The sliding hip screw (SHS) remains the foremost implant and should be regarded as the gold standard. Examples are the dynamic hip screw, compression hip screw and Ambi hip screw. Numerous case series reports and randomised trials have all demonstrated the superiority of this implant type over others.

The sliding hip screw is the standard against which other devices should be judged

The most common surgical complication after this operation is cut-out of the implant from the femoral head. This occurs in about 1-5% of cases and is more common for unstable fractures. The implant may protrude into the surrounding tissue or penetrate into the acetabulum. Symptoms include increasing pain and impaired mobility; and treatment depends on the severity of the symptoms as well as the fitness of the patient to undergo what may be major revision surgery. It may take the form of re-fixation of the fracture, replacement arthroplasty, or simple removal of the implant

Correct surgical technique is essential to minimise the risk of cut-out, particularly for unstable fractures[6].

Accurate technique minimises lag screw cut-out

Short intramedullary nails have developed considerably over the last ten years. They include the Gamma nail, intramedullary hip screw (IMHS), proximal femoral nail (PFN), Holland nail and Targon nail. Comparisons of these implants against the sliding hip screw have been made in numerous randomised trials. In summary, the nails were associated with an increased risk of fracture healing complications (7.5% versus 3.6%) and an increased re-operation rate (5.6% versus 3.5%)[6]. The main problem was the occurrence of fractures at the nail tip. It may be that design modifications will reduce this complication.

In the unstable trochanteric fracture, inadequate reduction and/or internal fixation increase the risk of fixation failure, medialisation of the femoral shaft, limb shortening, discomfort and slower mobilisation. Cephalomedullary (short) and cephalocondylic (long) intramedullary nails are often used in an attempt to obtain more secure fixation of these fractures. Trochanteric stabilisation and lateral support plates have also been used as additional components for the SHS. To date, none has been shown to be superior to the unmodified SHS. A Cochrane review in 2006 reported that there was insufficient evidence to show a difference between different

intramedullary nails[7]. Given the superiority of the SHS compared with intramedullary nails it is advised that further studies comparing nails are not a priority and that any new design should be evaluated in a randomised comparison with the SHS.

Subtrochanteric fractures

These fractures are less common, accounting for about 5-10% of all hip fractures. They present a considerable challenge to the surgeon as the high mechanical forces in this region lead to an increased risk of fixation failure. The sliding hip screw remains an acceptable method of treatment for this fracture, but is a technically difficult surgical procedure and requires an extensive surgical exposure. An alternative is to use an intramedullary nail. The more distal the fracture the greater the tendency to do so. Intramedullary devices are being used more frequently as nail and instrumentation design improve.

Non-Hip Fractures

Non-hip fragility fractures potentially account for about one third of inpatient and outpatient fractures. These include fractures of the distal radius, proximal humerus, vertebrae, pelvis (pubic rami), tibia, ankle[8]. Although, when compared with hip fracture, they comprise a range of generally lesser injuries, their functional impact in the frailer patient may be considerable. Decisions about treatment depend on specific surgical considerations such as the nature of the fracture and the available treatment options, and also on less specific factors such as the general fitness or frailty of the patient. Not surprisingly, there is much less evidence to guide decisions regarding treatment in this large and important group of patients.

Until recently, most of the implants used in fracture fixation were not specifically designed for obtaining and maintaining purchase in osteoporotic bone. In the past few years this has changed with the development of fixed angle and site specific plates as well as changes in the design of intramedullary nails. There are increasing numbers of favourable reports of experience with these promising but often expensive implants. Fixed angle plates appear to produce improved radiographic outcome but little work has been done to compare clinical outcomes with those of conventional treatments.

Promising new implants for the fixation of fragility fractures are becoming available, but require further evaluation

Management of fragility fractures of the vertebrae and distal radius is currently of particular interest because of recent developments in their treatment. They will therefore be dealt with in more detail.

Vertebral Compression Fractures [9-12]

It has been estimated that in Europe 20% of women aged over fifty will suffer a vertebral compression fracture (VCF) and although there has been shown to be a similar prevalence in men, it is thought that, as their fractures present at an earlier age, aetiology may be traumatic[13].

Patients with VCF are at a five-fold increased risk of further vertebral fractures and a two-fold increased risk of hip fractures[14].

Osteoportic thoracic and/or lumbar VCFs can cause pain, spinal deformity, instability, spinal stenosis and neurological compromise. Deformity persists in all cases and pain remains a problem in one third. In the past decade or so, percutaneous vertebral augmentation procedures in the form of vertebroplasty (previously used in the management of osteolytic metastases, myeloma and haemangiomata) and, more recently, balloon kyphoplasty, have been used in the treatment of VCFs, with 38,000 and 16,000 procedures respectively being performed in the United States in 2002.

Both aim to stabilise an affected vertebra by the introduction of an approved bone void filler, usually PMMA, normally via a transpedicular but sometimes extra-pedicular approach under continuous fluoroscopic control. In the case of vertebroplasty, the filler is introduced via a cannula under high pressure. In balloon kyphoplasty, partial correction of the vertebral deformity is achieved by the introduction of a balloon tamp which is then inflated under pressure prior to cement introduction. This technique reduces the pressure required for cement introduction and enables higher viscosity cement to be used, theoretically reducing the risk of cement leakage. The literature covering both procedures has been reviewed[9, 12].

Vertebral augmentation procedures relieve pain, at least in the short term

The symptomatic improvement produced by vertebral augmentation procedures appears to be maintained, at least in the short term. No randomised controlled trial comparing the two procedures has yet been published and long-term results are lacking. It might be expected that kyphoplasty is safer than vertebroplasty but no prospective comparisons have yet been performed. In both, cement embolization and serious neurological complications due to cement leakage have been reported.

No difference in pain relief and deformity correction between the two procedures has yet been demonstrated with certainty

There is some concern that the risk of fracture in adjacent vertebrae may be increased. The National Institute for Health and Clinical Excellence (NICE) has produced guidance for vertebroplasty (September 2003)[10] and balloon kyphoplasty (April 2006)[11]. They advise that evidence is adequate to support the use of these

procedures provided that normal arrangements are in place for consent, audit and governance. They also recommend good access to a spinal surgery service, prior discussion with a multidisciplinary team including a radiologist and a spinal surgeon, appropriate training, adherence to the manufacturer's instructions for cement preparation (to reduce embolisation) and that the procedure be limited to those whose pain is refractory to more conservative treatment.

Evidence supports the use of vertebral augmentation procedures with appropriate backup (NICE)

Whilst the development of vertebroplasty and kyphoplasty may give effective pain relief in 80%-90% of appropriately selected patients, there is undoubtedly a group of patients – mainly older – unsuitable for either of these techniques. These include those where there is a breach of the posterior vertebral wall, those who may not be fit for general anaesthesia, and those being treated in a centre where the surgical techniques are not available. It should be noted too that, though the clinical symptoms of vertebral crush fracture include back pain, loss of height, deformity, disability and limited spinal mobility, 70% may nevertheless be asymptomatic.

A patient presenting with acute pain may require hospitalisation. They will require aggressive pain management and recent studies have shown the effective use of (salmon) Calcitonin 100 international units daily for 10-14 days. Those who cannot be admitted or wish to be managed at home, can be treated successfully with nasal Calcitonin and low-dose Buprenorphine patches.

This regime has been shown to dramatically relieve the acute pain within 24-48 hours and to increase the rate of the patient's mobilisation over the subsequent 2 weeks[15]. Additional analgesic support can be provided, using small doses of opiates, paracetamol, and non-steroidal anti-inflammatory agents incorporating misoprostol. Those presenting with more chronic symptoms may benefit from therapy designed to develop the strength of their vertebral extensor muscles to help improve their posture[16].

Sacral insufficiency fracture is an often-unsuspected cause of sudden increase in low back pain and can be severely debilitating. Patients are often unable to walk and have to be admitted to hospital. The diagnosis is usually confirmed by technetium scintigraphy/computed tomography scan. Many, but not all, are severely debilitated and may be receiving steroid treatment. They require aggressive pain management with the use of opiates, Paracetamol, non-steroidal anti-inflammatory agents with Misoprostol, combined with the use of Calcitonin and TENS applied locally.

Fractures of the Distal Radius

Although a satisfactory reduction is often obtained by manipulation, follow-up x-rays

show that it frequently deteriorates, with union eventually occurring in a position not dissimilar to that seen on the diagnostic films. Outcome-related criteria for radiographically assessing fracture position (radial inclination, radial length, volar tilt and articular step-off in the distal and DRUJ articular surfaces) were not specifically developed for the older patient. Accordingly, their application in this group is unclear.

The outcome in extra-articular distal radius fractures in the elderly seems to bear less relationship to radiographic appearance than in younger patients. A significant amount of residual deformity in low-energy injuries is well tolerated by many patients, particularly those with low functional demands, but there are some in whom the outcome is unacceptable. Identifying the relevant radiographic feature(s) will enable a more informed choice regarding the best form of treatment and so lead to improved outcomes. It may be that use of the above criteria should be confined to the fit and active patient. It is usually recommended that decisions should take account of the patient's functional requirements and general medical condition.

The radiographic criteria that indicate the need for surgical intervention in fragility fractures of the distal radius are less clear than in the younger patient

The options for management include (i) manipulation and cast application, (ii) manipulation, percutaneous K-wire insertion and cast application, (iii) application of a bridging or non-bridging external fixator and (iv) open reduction and internal fixation. Controversy exists as to which gives the best outcome in the fragility fracture of the distal radius and when it should be used. There has been much interest in the recently developed fixed-angle (locking) plate systems which seem to be effective at maintaining fracture reduction but how important is this? High volume prospective studies focusing on the older osteoporotic patient and using consistent classification systems and outcome measures are required to establish the place of each of the above forms of treatment and to determine whether a different approach is required in low and high demand older patients.

Outpatient care of fragility fractures

Patients who do not require admission for inpatient treatment and attend the fracture clinic should be seen without delay. They, their relatives and carers should be kept fully informed. Where new dependency occurs as a result of the fracture, the necessary assessments and services should be provided. All patients should have contact with a Fracture Liaison Service so that secondary prevention measures can be offered.

Areas for Research

Many questions remain to be answered concerning the management of fragility fractures. Of particular interest are those that relate to high volume cases. The following are some examples:

- What is the effect of delay to surgery on outcome in the management of hip fractures?
- What is the best form of fixation for the unstable (large lesser trochanteric fragment, multiple fragments, fractured lateral spike or reverse oblique/transverse configuration) intertrochanteric fracture?
- What is the place of total joint replacement in the management of the displaced intracapsular hip fracture?
- What radiographic outcome predictors should be used to judge the adequacy of reduction of fragility fractures of the distal radius? Are they different in high and low demand patients?
- What are the indications for and outcome-related benefits of the increasing number of fixed-angle and site-specific implants designed for use in osteoporotic bone?
- Who might benefit from vertebral augmentation with vertebroplasty or kyphoplasty, and what are the long term results and consequences of these procedures?

1.3 Post-operative care

Analgesia

Analgesia is extremely important in the management of hip fracture. Good pain control in the early stages of care will promote comfort and confidence; and later on, if pain is poorly controlled, early mobilisation will be delayed; dependency – bringing with it the usual complications of prolonged bed rest – will rise; and risks of post-operative delirium will be increased.

Many acute hospitals now have a dedicated acute pain team, often led by a senior nurse and supported by a consultant anaesthetist, and covering the hospital during office hours. The services of such a team should be invoked where necessary. However, the existence of a pain team does not absolve the trauma unit staff looking after the patient of the responsibility for determining the presence of pain and providing analgesia. Reliable and effective ward-based pain control routines are an integral component of good hip fracture care, and regular formal charting of pain scores ensures their delivery.

The diagnosis of pain in a patient with cognitive impairment due to dementia may be particularly difficult, and requires familiarity with the patient and possibly information from other carers. Many studies have shown that cognitively impaired and acutely confused patients receive less analgesia than their unimpaired counterparts. This is generally because nursing and medical staff rely on self-reporting of pain and rarely consider pointers to the presence of pain, either behavioural (moaning, sighing, guarded posture) or physiological (tachycardia, high blood pressure).

> Reliable and effective pain control ensures patient comfort and confidence, and is essential for early rehabilitation.

In the immediate post-operative period opiates still form the mainstay of treatment, preferably given orally or intramuscularly. Intravenous opiates may be used, but only with small incremental doses because of the unpredictable response in the elderly. Regular paracetamol and other analgesia (eg. codeine phosphate or tramadol) should be provided to all patients, with the aim of pre-emptive pain control to promote comfort both at rest and during active rehabilitation, and with dosage timed in anticipation of the latter as necessary.

Traction for hip fracture prior to surgery is no longer used, having been shown to have no benefit[17]. There is little published evidence to support the use of routine intrathecal opioids or individual nerve blocks – though some units use these techniques enthusiastically and successfully.

Non-steroidal analgesics should be avoided. Gastrointestinal toxicity is a major

concern, as is the risk to renal function in hypovolaemic, recently injured or post-operative older patients. Adverse effects on fracture healing are also a consideration.

Blood transfusion

In the absence of reliable evidence to guide the use of blood transfusion after hip fracture surgery, practice varies considerably. Local protocols are variably in use. Further research is required.

Wound care

Wound haematoma is the most common complication of wound healing, with an incidence of 2-10%. Varying definitions of what constitutes a haematoma lead to differences in incidence, with some degree of bruising to be expected for all wounds. Small haematomas can be allowed to resolve spontaneously but larger collections will require surgical drainage.

Deep wound infection is a most devastating complication, with a mortality approaching 50%. It is defined as infection of the wound below the level of the deep fascia and invariably involves the implant. The incidence varies from about 1-5%, being somewhat higher after arthroplasty than internal fixation. Treatment generally involves surgical debridement, often with removal of the implant (Girdlestone excision arthroplasty) leaving the femur without its head. A younger patient with this outcome may be able to regain some mobility with walking aids, but this is unlikely in older frailer patients.

Deep wound infection – involving the implant – is uncommon, but devastating in its impact: around half of patients die, and few survivors regain mobility

Superficial wound sepsis refers to infection of the wound that does not extend below the deep fascia layer. It is more common than deep sepsis and can be more effectively treated with antibiotics and, if indicated, surgical debridement.

Pressure area care

Pressure ulcer prevention should be addressed at the earliest opportunity. Lying on a hard surface, such as a hospital trolley, for as little as 30 minutes can result in the development of a pressure ulcer; and six weeks later an eminently preventable ipsilateral heel lesion thus acquired may cause more discomfort and disability than the hip fracture which preceded it.

Factors contributing to pressure sores are:

- Time spent lying on floor at home after the fall
- Delays in the Accident and Emergency Department
- Hard surfaces on AED trolleys
- Hard mattresses on the ward
- Poor nutrition
- Anaemia
- Delays from admission to surgery
- Prolonged surgery
- Failure to mobilise the patient immediately after surgery

One third of hip fracture patients will develop pressure sores[18], most of which could be prevented by good anticipatory care.

All patients should be rested on pressure-reducing surfaces – from admission, in transit, in theatre, and in the ward, where high specification pressure-relieving mattresses should be readily available. Additional pressure-relieving heel protection may also be needed.

Regular repositioning is part of good care; if lifting and handling skills are of a high standard, and pain control is managed positively, it need not cause undue discomfort to the patient. Early mobilisation in the post-operative period will also reduce the risk of pressure ulcer formation.

A formal pressure area risk assessment is recommended for all patients[17] with pressure area skin inspection on admission and at least twice a day while patients remain immobile. The finding of early or superficial skin damage should immediately trigger appropriate care – which can prevent or reverse many impending ulcers. Risk factors such as pressure, shearing forces, friction, incontinence, pain and malnutrition should be addressed, and if problems arise the patient should be referred to an expert on tissue viability.

Standard 3

All patients with hip fracture should be assessed and cared for with a view to minimising their risk of developing a pressure ulcer

NHFD – field 4.07

Thromboprophylaxis

Thromboembolism may explain a substantial proportion of morbidity and mortality after elective orthopaedic surgery, but is only one of many complications seen after hip fracture – where the 10% inpatient mortality includes only about 0.5% that results from pulmonary embolism (PE).

The apparent incidence of thromboembolism depends on how intensively it is sought. Routine venography demonstrates deep vein thrombosis (DVT) in 19% to 91%, and routine isotope lung scans show PE in 10% to 14% of patients, but the clinically apparent incidence is only about 3% for DVT and about 1% for PE.

Cyclic leg compression devices and foot pumps reduce the incidence of thrombosis, but can be labour-intensive and expensive. Graduated stockings are effective, but are painful to put on in the presence of a hip fracture, and risk causing foot sores in people with fragile skin or vascular insufficiency. Chemical prophylaxis will markedly reduce the incidence of DVT and PE, but carries the risk of inducing bleeding complications, and increasing the rates of wound healing complications.

The overall balance of these risks and benefits is complex in hip fracture patients. For instance, though heparins reduce the incidence of venographic DVT from 39% to 24% a systematic review of randomised trials showed a trend for heparins to increase (11% vs. 8%) overall mortality[19]. Similarly, low dose aspirin reduced clinical DVT from 1.5% to 1.0% and fatal PE from 0.6% to 0.3%, but increased the incidence of wound problems (3% vs. 2.4%) and gastrointestinal haemorrhage (3.1% vs. 2.1%) and had no effect on overall mortality[20].

The approach to perioperative care that we have outlined, ensuring early surgery and immediate post-operative mobilisation, and avoiding prolonged operations and over-transfusion, will help to reduce the incidence of clinical thrombosis. This may increasingly mean that the adverse effects of prophylaxis outweigh any clinical benefits. The low frequency of clinical and fatal PE means that trials with these end points are probably not possible. As a result, the conflict between wanting to prevent coagulation where it is harmful, without preventing it at surgical sites or in the spinal canal, will probably remain unresolved.

Early mobilisation is effective in lowering the risk of clinical thrombosis

Despite this lack of evidence for clinical benefit a number of published guidelines make a case for routine thromboprophylaxis[17,21,22]. The NICE guidance[21] will clearly have considerable influence on practice in the UK, and in its current form strongly advocates mechanical prophylaxis, along with chemoprophylaxis (fondaparinux or low-molecular heparin) continued for 4 weeks after surgery. As the Blue Book goes to press, this guidance is being widely discussed.

As such discussion demonstrates, controversy over thromboprophylaxis continues within orthopaedic units in the UK. In particular there is an urgent need to establish whether chemical prophylaxis remains as effective if its initiation is delayed until after surgery[21], potentially avoiding many of the anaesthetic, operative and wound concerns we have mentioned. Answering this question should be a priority for the National Hip Fracture Database.

The complexity of the literature on this subject should not distract us from a focus on prompt operative management. The worst case scenario would be the use of a thromboprophylactic agent which further delays surgery in an already vulnerable group of patients [23]. A clear, consistent protocol to prevent thromboembolism is just one of the issues that must be agreed by the surgical, medical and anaesthetic leads for any trauma unit.

Nutrition

Poor nutritional state is a powerful risk factor for hip fracture, and practical problems with feeding pose a major threat to recovery following the injury. Many people do not eat and drink adequate amounts while in hospital, putting their health and recovery from illness at risk.

Hip fracture inpatients achieve only half their recommended daily energy, protein and other nutritional requirements[24]. Nutrition is an inter-disciplinary concern, which requires effective liaison and communication between all members of the clinical and operational services teams. A number of approaches to nutritional support have been studied[25].

The strongest evidence for the effectiveness of nutritional supplementation exists for oral protein and energy feeds, but the quality of trials to date is poor. Oral multinutrient feeds (providing energy, protein, vitamins and minerals), may reduce the risk of death or complications[25]. Supplementary protein in an oral feed did not alter mortality, but may have reduced the number of long-term complications and days spent in rehabilitation wards.

Patients' acceptance of supplement drinks is often poor, but it is unrealistic to impose nasogastric feeding as a routine approach. It is therefore crucial that all staff dealing with patients recovering from hip fracture understand the importance of adequate dietary intake, and that specific attention is given to helping people to eat at meal times. Simple practical measures such as providing additional carers to assist in nutrition can be very effective, and have been shown to reduce mortality[26]. Part of routine nursing care should include assessment of nutritional intake, and where appropriate referral on to the dietician for specialist advice for optimisation of nutritional intake.

Early rehabilitation

After surgery it should be normal practice to sit the patient out of bed and begin to stand them on the day after surgery. Progress thereafter will vary considerably and will depend on the individual patient and the type of fracture. Patients with an extracapsular fracture will tend to take longer to mobilise than those with intracapsular fractures.

Weight-bearing

With current surgical techniques and implants, there should be very few occasions on which weight-bearing is restricted. Most elderly patients who sustain a hip fracture will be unable to comply with instructions on limited weight-bearing, and only rarely be able to cope with the difficulties of walking 'non-weight bearing'. In practice most patients will weight-bear as pain allows, and become fully weight-bearing as the fracture heals.

Efforts to commence supervised full weight-bearing mobilisation should usually commence on the first day following surgery.

Hip movements

Traditional practice was to restrict hip flexion after an arthroplasty. This was to reduce the risk of prosthetic dislocation, and meant that the patient required a raised bed and chairs and was restricted from getting in and out of a car or bath. Such measures are still used for a total hip replacement, but for a hemiarthroplasty introduced via an antero-lateral approach should no longer be necessary. Refinements in surgical technique with a more careful repair of the hip joint capsule reduce the risk of dislocation, and should make any restrictions on hip movements unnecessary.

1.4 Models of orthogeriatric care

The multifactorial nature of the problems facing fragility fracture patients requires a multi-disciplinary approach, and the importance of effective teamwork has already been emphasised. Since the original descriptions of the benefits of collaboration between orthopaedic surgeons and geriatricians in the 1960s[27,28], most trauma services in the UK have moved to develop at least some form of formal geriatrician input to the care of older inpatients recovering from fractures.

Patterns of collaboration vary considerably, and substantial progress has been made in recent years, with many more orthogeriatricians being appointed, and – most encouragingly – increasing interest on the part of trainees in both orthopaedic surgery and geriatric medicine. Junior as well as senior medical staffing in trauma units should reflect the realities of clinical need, and the training provided in both geriatric medicine and orthopaedic surgery respond to these realities too.

Good multidisciplinary working can take many forms, but always requires positive attitudes, good communication and sharing of information, an adaptive and flexible approach to collaboration, and real commitment from all concerned to promote quality care and good outcomes.

Good multidisciplinary working depends on:

- Good communication/ information-sharing
- Flexible collaboration
- Collective responsibility for care and outcomes

Common models of orthogeriatric care include:

Traditional orthopaedic care

The elderly fracture patient is admitted to a trauma ward and their care and subsequent rehabilitation is mainly managed by the orthopaedic surgeon and team. Geriatrician input to such wards can take a variety of forms. In some units medical queries are dealt with by a consultative service, but in others there is regular input including once or twice-weekly geriatrician rounds, or multidisciplinary ward rounds involving both medical and surgical staff.

Geriatric Orthopaedic Rehabilitation Unit

Peri-operative orthopaedic management is followed by early post-operative transfer to a geriatric rehabilitation unit. The identification of appropriate patients may be left to orthopaedic staff, be led by specialist orthogeriatric liaison nurses/hip fracture nurses, or be part of routine geriatrician rounds.

The extent of orthopaedic input to the rehabilitation ward varies, depending on how soon patients are moved from the acute wards; ready access to orthopaedic advice is vital if rehabilitation momentum is to be maintained. A weekly surgeon visit at a predictable time will allow multidisciplinary team members to present concerns, problems and x-rays. An alternative is the orthopaedic liaison nurse who visits the rehabilitation wards to give advice, adjust plaster casts, and liaise with orthopaedic surgeons.

Orthogeriatric liaison and the Hip Fracture Nurse

Collaborative working requires effective communication between senior medical, surgical and anaesthetic staff. Combined ward rounds are usually impractical given the competing demands of each professional's timetable, but it is invaluable if the admitting team can meet with medical and anaesthetic staff at the end of the post-take ward round.

An alternative approach is for senior nursing staff to take on a liaison role. This may take the form of specialist nurses being specifically tasked with coordinating peri-operative care, rehabilitation or secondary prevention, but an especially effective model is that of the Hip Fracture Nurse.

A Hip Fracture Nurse will take responsibility for patients throughout the course of their clinical care; coordinating initial assessment, expediting pre-operative work-up, supervising post-operative care, rehabilitation, discharge planning, secondary prevention and follow-up.

Frail and confused older patients, their families and carers are invariably appreciative of such an approach. It offers a consistent friendly face throughout the complexities of modern clinical care, bridges the repeated changes of staff in shift-based medical and nursing practice, and allows for the early identification of medical, orthopaedic, psychological and social problems. The nurse's involvement in the development of routine protocols will allow them to deal with such problems as they arise, or to coordinate input from medical, orthopaedic, or other specialist teams if necessary.

Hip Fracture Nurses will lead the multidisciplinary assessment of patients, and as a result are ideally placed to coordinate audit data collection, such as for the National Hip Fracture Database, as a routine part of their daily work with individual patients.

Combined orthogeriatric care

The fracture patient is admitted to a specialised orthogeriatric ward under the care of both geriatricians and orthopaedic surgeons. This degree of collaboration is central to the concept of a Hip Fracture Service, with pre-operative assessment by the orthogeriatric medical team, who will take the lead in post-operative multidisciplinary care. Rehabilitation may occur in this setting or in a separate rehabilitation unit.

Early supported discharge and community rehabilitation

Increasingly, community rehabilitation schemes are being implemented which allow the more able fracture patients to be discharged directly to home from the orthopaedic ward. Multidisciplinary assessment, with the involvement of geriatric physicians, is essential to ensure optimal patient selection. Earlier discharge may be facilitated by referral to the community rehabilitation team or the Geriatric Day Hospital. Such ongoing rehabilitation will allow patients to graduate from using a frame, to a stick, and to no walking aid if appropriate. Advice and practice about walking outside and a possible return to driving may also be given.

The effectiveness of orthogeriatric collaboration

Evidence as to the effectiveness and cost-effectiveness of these various models is complex and still evolving.

The National Services Framework for Older People[29] states that "at least one general ward in an acute hospital should be developed as a centre of excellence for orthogeriatric practice". It does not, however, recommend a particular type of orthogeriatric collaboration, but advocates that this should be agreed at local level.

A number of research trials have been published describing different models of care but only a few of these are of sufficient quality to allow their inclusion in the Cochrane review of Coordinated Multidisciplinary Hip Fracture Care[30]. These studies consider different models of care, each adapted to its context, and as a result it is difficult to draw clear conclusions from their findings.

The Cochrane review concludes that there is "no conclusive evidence of the effectiveness of coordinated post-surgical care … but a trend towards effectiveness in all main outcomes".

The NHS Health Technology Assessment Programme has also performed a systematic review of the evidence in respect of Geriatric Rehabilitation Following Fractures in Older People[31]. This very comprehensive document considers four broad categories of approach that have been proposed as alternatives to traditional orthopaedic care.

The review is guarded in its conclusions about Geriatric Orthopaedic Rehabilitation Units, and raises concern that the additional costs of such units may not be justified by improvements in patient outcome. Such concerns are borne out by experience in the US and Scandinavia, and by the results of the East Anglia Hip Fracture Audit[32] which indicated increased length of stay in units which routinely transferred larger proportions of trauma patients to rehabilitation in other wards. Pressures on acute hospital sites may encourage Trusts to consider such developments, but this may not be the most effective way for geriatricians to improve the outcome for older trauma inpatients. As such post-acute rehabilitation services evolve, continuing evaluation of

their effectiveness will be essential, and can be addressed via NHFD.

In contrast, the review concludes that there is good evidence to support development of collaborative approaches in the acute setting such as the 'Geriatric Hip Fracture Programme', as these are effective in improving outcome. It also suggests a benefit from the use of intermediate care initiatives such as Early Supported Discharge schemes, and perhaps of Care Pathways to expedite rehabilitation and discharge.

Active acute rehabilitation, early supported discharge and community rehabilitation schemes enable a higher proportion of patients to return directly home, with reduced length of stay.

Geriatric Orthopaedic Rehabilitation Units can meet the rehabilitation needs of frailer patients. Though overall length of stay rises, return home may still be achieved.

Integrated Care Pathways (ICPs) act as the patient's medical record, and aim to ensure that the patient receives the recommended standards of care at the appropriate time. Some units have found ICPs helpful in improving key areas in the management of hip fractures – such as optimisation for surgery, early mobilisation, communication with the patient, and discharge planning. If such documents are to be successful in catalysing change it is essential that all members of the MDT are involved in their development and continuing use.

Collaborative orthogeriatric care

A high standard of medical management of elderly fracture patients 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 elderly fracture patients.

Standard 4

All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support from the time of admission

NHFD – field 4

The physician should be fully integrated into the fracture service, providing daytime medical cover, although weekend and out of hours cover can be provided by the on-call medical teams. Several senior medical ward rounds should occur each week, so that additional medical support and advice is offered and patients suitable for rehabilitation are identified and assessed. Medical input begins on admission to the fracture service, continues smoothly through the peri-operative period, and on to

rehabilitation, discharge planning, and secondary prevention of fracture – both in hospital and through outpatient and intermediate care services following discharge.

The collaborative model of care shared between orthopaedic surgeons and geriatricians on the acute orthopaedic ward has many advantages for the rapid and effective assessment and pre-operative optimisation of frail older trauma patients such as those with hip fracture. These include:

Improved medical care

The management of frail fragility fracture patients can be daunting for an experienced practitioner, let alone a newly qualified doctor. An orthogeriatrician seeing the patients on a daily basis will provide supervision of junior medical staff and continuity of care – a better arrangement than a consultative service where different doctors of different grades may see the patient on different days.

There are many opportunities for medical intervention in the peri-operative management of elderly fracture patients. The orthogeriatrician is well placed for the early identification and treatment of complications, and can liaise with other medical specialties as required. Early intervention for medical complications is more likely, and likely to prevent acute deterioration leading to surgical delay or even death.

Delirium is common in elderly hip fracture patients and daily intervention by a geriatrician has been shown to reduce this distressing symptom in such patients[33].

Senior medical input – from a consultant orthogeriatrician with major sessional commitments to the trauma unit – is now essential in the good care of fragility fracture patients; with improvements in pre-operative assessment, medical care, and coordination of early rehabilitation.

Complex ethical issues concerning consent, DNAR status, nutrition difficulties, and the possible need for palliative care may often arise in the care of frail or confused fragility fracture patients. Such issues are more easily resolved when an on-site orthogeriatrician is available to consult with patients and their families, and to give advice and leadership to the multidisciplinary team.

The National Confidential Enquiry into Perioperative Deaths 1999 report, entitled 'Extremes of Age'[34] stated that "A team of senior surgeons, anaesthetists and physicians needs to be closely involved in the care of elderly patients who have poor physical status and high operative risk".

Optimal scheduling of fracture surgery

A daily senior medical presence enables anaesthetists to be contacted well in advance of surgery for frail patients in order to help co-ordinate the required preoperative

investigations and to optimise the patient medically. High-risk patients can be identified in advance, enabling appropriate scheduling of patients for management by senior anaesthetic and surgical staff.

Better communication with patients and their relatives

The process of communication is greatly enhanced by the daily presence of an orthogeriatrician. Due to the emergency nature of fracture surgery, surgeons may not be readily available at ward level to discuss cases with patients and their relatives. This can generate anxiety, distress and complaints. Delays to surgery are often due to acute medical deterioration and the ortho-geriatrician may be more easily accessible to discuss these problems. A hip fracture can be a catastrophe for an elderly patient and its consequences are greatly feared. The anxieties of patients and their carers must be recognised and addressed sympathetically.

Better communication within the multidisciplinary team

High quality management of older fracture patients relies on excellent communication between the various members of the multidisciplinary team. Successful peri-operative care, rehabilitation and discharge requires close cooperation between patients and their relatives, nursing staff, physiotherapists, occupational therapists, social workers and discharge co-ordinators. A readily available geriatrician can only enhance this process, and the presence of an orthogeriatrician may enable the whole rehabilitative process to take place in the initial fracture ward.

Initiation of research, education and audit

The orthogeriatrician is in a position to initiate and take part in innovative research and audit activities with an emphasis on medical issues rather than the traditional surgical ones. Expertise in geriatric medicine is conveyed to the various members of the multidisciplinary team by educational initiatives, and by fostering a culture where all the patients' problems are considered, not merely their surgical management. Supervision and education of the surgical pre-registration house officers are enhanced.

Reduction in adverse events

A medical presence on the ward is likely to reduce the incidence of adverse events. Clerk-ins by the junior staff are continually monitored leading to higher standards of documentation. Other simple measures, such as the review of admission medications, and the development of protocols for managing high-risk cases such as diabetic patients or those on warfarin, can promote clinical safety. In general terms, a more proactive approach to medical care – anticipating rather than reacting to medical problems – will result.

Earlier initiation of rehabilitation and assessment for secondary prevention; more effective use of discharge resources

An orthogeriatrician based on the fracture ward is ideally placed to identify patients suitable for rehabilitation and step-down schemes. This ensures their smooth passage through the peri-operative period into the rehabilitation phase. Issues such as investigation and treatment of osteoporosis can be addressed at an early stage, and the multifactorial elements of falls prevention can be integrated into the multidisciplinary team's rehabilitation and discharge planning.

After surgery, a variety of options are available for the further care of the patient. Some patients may be suitable for early discharge to their home, with appropriate support services; others may be discharged back to their nursing homes. The orthogeriatrician is well placed to facilitate the movement of frail, complex, elderly patients into community-based rehabilitation structures.

However, many osteoporotic fracture patients will benefit from a period in a rehabilitation unit with early involvement of a multidisciplinary team including medical staff, nursing staff, occupational therapists, physiotherapists and social workers. Patients' families will also benefit from this arrangement.

Patients with a good pre-fracture level of mobility and lack of mental impairment tend to benefit most from rehabilitation schemes[35]. However, historical practice, geographical considerations and other local circumstances will tend to have determined the arrangements for and availability of step-down rehabilitation in different Trusts. Transfer of patients for rehabilitation appears to lead to an increase in their length of stay[32], so the optimal use of such rehabilitation resources needs careful consideration. However, for the frailest patients, such services may provide a valuable last chance of a return home.

Early, active multi-disciplinary rehabilitation, linked to good community-based rehabilitation and social care services, will serve to:

- maximise recovery and return home
- meet patients' aspirations
- reduce length of stay
- substantially reduce the overall costs of care of fragility fracture patients

If acute wards perceive rehabilitation and discharge planning as not being their responsibility, they will accumulate patients who are seen as simply waiting for rehabilitation. These patients will fail to make progress in the crucial early post-operative days, and may be demoralised, confused and deconditioned when the time comes for them to move to other hospital or community rehabilitation settings.

The presence of the orthogeriatrician in the acute setting, leading the multidisciplinary assessment and continuing rehabilitation of all eligible patients, will minimise the risk of such inertia, maintain their morale and momentum, and maximise their prospects of returning home.

Areas for Research

Questions remain to be answered concerning the post-operative management of hip fracture and fragility fractures generally, and concerning rehabilitation and the organisation of services. The following are some examples:

- Development and evaluation of measures that will deliver consistently successful pain control in busy trauma wards
- Large-scale work to improve the evidence around the use of blood transfusion after hip fracture
- Continuing research on optimal thromboprophylaxis that combines effectiveness with patient safety
- Further exploration – perhaps via observational studies or sprint audits within NHFD – of the efficacy and cost-effectiveness of various models of orthogeriatric rehabilitation provision, in terms of rate of return home and of the avoidance of institutionalisation/loss of home
- Large-scale work on casemix-adjusted outcomes in hip fracture care – again via NHFD – that would add credibility to (e.g.) studies such as that on efficacy and cost-effectiveness

2. Promoting high quality secondary prevention of fracture – bone protection and falls assessment

2.1 Why secondary prevention matters

Demographic change in the UK will result in a substantial and inevitable increase in the incidence of fractures, including hip fractures, during the first half of the 21st century. A UK-wide strategy that makes best use of current good practice in secondary prevention is already overdue. In the words of a recent review[1]:

> "A major change is needed in fracture services to ensure that every patient presenting with a fragility fracture is assessed for osteoporosis and referred for treatment as appropriate.
>
> Furthermore, secondary prevention should not only address osteoporosis. The risk of additional falls should be addressed, in terms of the patient's medical condition and that of their environment.
>
> Because of the high proportion of fragility fractures that are not the patient's first fracture, the potential payoff of systematic secondary prevention is considerable and must form an important part of the battle to survive the epidemic that confronts us."

Between one half[2-4] and two thirds[5] of hip fracture patients have experienced a prior fracture; this could and should have served as a trigger for assessments of both osteoporosis and falls risk to reduce the incidence of secondary fracture.[6] However, hip fractures constitute only a quarter of fragility fractures – three quarters of which occur at other sites, most commonly at distal radius or ulna.[7,8]

Fracture begets fracture; two meta-analyses[9,10] concluded that a prior fracture at least doubles a patient's future fracture risk and the risk of further fracture in the future may be even greater in men.[11-13] While future fracture risk is greatest during the first year after the incident fracture – thus highlighting the urgency of rapid post-fracture intervention[11] – the additional fracture risk persists for up to 10 years after the initial fracture episode.[12]

During the last two decades, a range of therapeutic interventions have been thoroughly assessed in multiple large-scale randomised controlled clinical trials and have demonstrated consistent fracture reduction efficacy in osteoporotic patients with fractures. A comprehensive meta-analysis of the principal agents licensed for the treatment of osteoporosis in the major world markets suggests that a 50% reduction in fracture incidence can be achieved during three years of pharmacotherapy.[14] Notably, fracture reduction efficacy of 50% during three years of treatment has been demonstrated for patients presenting with a multiple fracture history.[15]

Bone protection therapy is effective, with 50% reduction in fracture incidence demonstrated during 3 years of treatment

In January 2005 NICE published Technology Appraisal 87: "Bisphosphonates (alendronate, etidronate, risedronate), selective oestrogen receptor modulators (raloxifene) and parathyroid hormone (teriparatide) for the secondary prevention of osteoporotic fragility fractures in post-menopausal women".[16] The treatment algorithm recommended by this guidance is described in the treatment component of this Blue Book under section 2.4, p.51.

At the time of writing, NICE is in the final stage of deliberations to update Technology Appraisal 87 which is expected to be published in late 2007 or 2008. Accordingly, readers are referred to the NICE website[17] for updates on the guidance entitled "Osteoporosis – secondary prevention including strontium ranelate" which will be pertinent to the management of patients identified by the implementation of the systems to be described in the secondary prevention of fracture section of this Blue Book. Additional information concerning the current NICE assessment process for both Technology Appraisals and the forthcoming Osteoporosis Clinical Guidelines is available from the National Osteoporosis Society website at www.nos.org.uk.

Whatever the details of emerging guidance on bone protection therapy, the occurrence of a new fracture provides an opportunity to assess for treatment for osteoporosis with potential to halve the subsequent risk of fractures, including hip fractures[16].

The current management gap

Studies from the UK suggest that currently fewer than 30% of patients with a fracture undergo osteoporosis risk assessment and subsequent treatment for secondary prevention of fracture.[18-27] Accordingly, patients presenting to secondary care with new fractures should be prioritised for assessment. Treatment rates amongst patients that have experienced a fracture in the past highlight the historical gap in secondary preventative management.

A recent audit undertaken in a UK primary care setting suggests that among women with a past history of fracture[24] only 5% had undergone a DXA scan and <10% were receiving treatment for secondary prevention of fracture. Estimates of fracture prevalence amongst post-menopausal women from the UK[24], Australia[28] and France[29] suggest that 1.3-2.0 million of the 10.6 million women ≥ 50 years of age resident in the UK are likely to have a history of fragility fracture.

Bone protection therapy is at present grossly underutilised for the secondary prevention of fragility fractures in the UK

Most fractures result from a fall. Interventions to reduce the risk of falls after the occurrence of a fracture may contribute to the reduction in the risk of further fractures. Falls are common and increase with age. Thirty percent of those aged 65 or more who live in the community fall each year, increasing to 45% in those aged 80 or above[30,31]. Between 10% and 25% of fallers sustain a serious injury and up to 6% culminate in a fracture.[32,33]

Recurrent falls are associated with increased mortality, increased rates of hospitalisation, curtailment of daily activities and higher rates of institutionalisation.[34-36] This is compounded further by the psychological sequelae with loss of confidence, increased fear of falling, lower quality of life[37] and post-fall anxiety syndrome.[38] Half of fallers will have a further fall within the next 12 months.[39]

A recent national audit[40] demonstrated that fewer than half of patients admitted to hospital with a fracture are routinely offered a falls risk assessment. Furthermore, only 15% of older patients managed in the fracture clinic setting receive advice on modifying their falls risk.

2.2 Assessment for secondary prevention of fracture

Reduction of future fracture risk for patients presenting to hospital with fragility fractures will be optimised by an integrated approach to delivery of routine assessment for osteoporosis for all fracture patients over 50 years and falls risk assessment, where appropriate, amongst older fracture patients.[1]

(i) Post-fracture osteoporosis assessment

Standard 5

All patients presenting with fragility fracture should be assessed to determine their need for antiresorptive therapy to prevent future osteoporotic fractures

NHFD – field 5.02

All patients aged ≥ 50 years presenting to hospital with fragility fractures should undergo assessment for osteoporosis by axial bone densitometry. Targeting treatments at patients who have been confirmed to have osteoporosis has been shown to halve the risk of further fracture at all skeletal sites, including fractures of the hip.[16] The key challenge facing hospitals throughout the UK is how to consistently deliver this secondary preventative assessment to the 310,000 fracture patients who present every year.[41]

The most effective healthcare solution is the Fracture Liaison Service (FLS)[7] designed to identify and assess patients presenting with a new fracture whether as outpatients at the fracture clinic or as orthopaedic inpatients. This service model has been recognised internationally[42-44] and by the UK Department of Health[45] as a model of best practice for implementing reliable assessment and treatment for secondary prevention of fracture.

The full rationale, objectives and outcomes of these components have been comprehensively described elsewhere[8,46,] However, an overview of the operational structure of a Fracture Liaison Service with integrated falls risk assessment is provided in Figure 1.

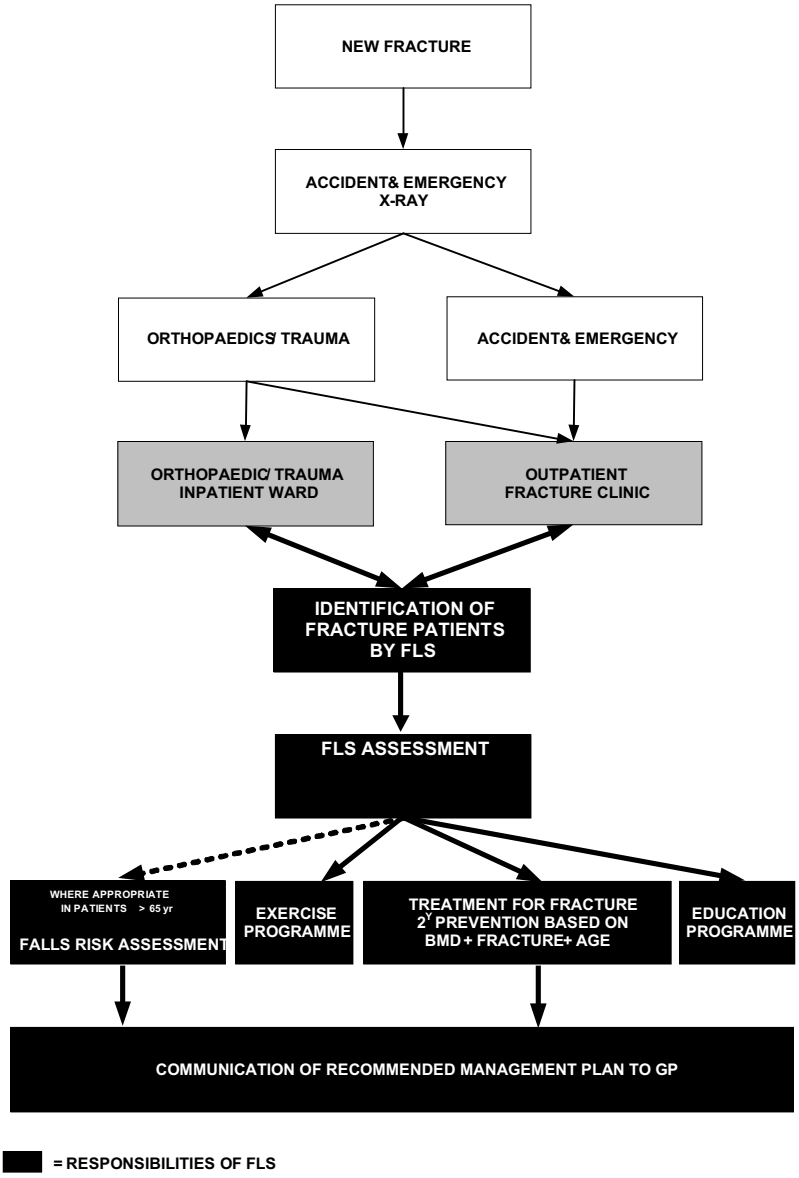
An integrated Fracture Liaison Service is routinely delivered by a Nurse Specialist supported by a Lead Clinician in Osteoporosis. The Nurse Specialist identifies patients with new fragility fractures who have been admitted to the orthopaedic inpatient ward or who have been managed as outpatients through the fracture clinic. The Nurse Specialist then arranges attendance of appropriate patients at the 'one-stop' FLS clinic where BMD is measured by DXA to assess future fracture risk. Treatment for secondary prevention of fracture is initiated by the FLS when merited on the basis of future fracture risk. Older patients, where appropriate, are identified and referred onto the falls service/falls pathway (as appropriate for that hospital/local

PCT/healthcare economy).

> Routine proactive case-finding by an integrated Fracture Liaison Service is the most effective means of providing secondary prevention

The liaison role includes networking with other agencies and strategies to enhance fracture and falls risk reduction (Figure 1) and with patients' GPs to ensure that recommended treatments are prescribed. By removing the need for orthopaedic surgeons to refer patients or for GPs to perform 'case-finding' and subsequent referral of fracture patients, an FLS achieves post-fracture assessment up to seven times more often than other service models evaluated in the UK.[3] An FLS provides expertise in osteoporosis, secondary prevention of fracture and early identification of falls risk and crucially integrates seamlessly with the post-fracture pathways of care for inpatients and outpatients with fractures.

Figure 1. Overview of a Fracture Liaison Service integrated with post-fracture falls risk assessment



The Fracture Liaison Service model has been adopted by a growing number of UK hospitals since publication of the previous BOA Blue Book on care of the fragility

fracture patient in September 2003.[47-50] However, a national audit published in 2006[40] suggested that only 27% of hospitals in England had established an FLS and so identified a major opportunity to improve integrated care of the fragility fracture patient across the UK in the future.

(ii) Post-fracture falls assessment

Standard 6

All patients presenting with a fragility fracture following a fall should be offered multidisciplinary assessment and intervention to prevent future falls

NHFD – field 5.01

All older patients should undergo falls risk assessment in addition to osteoporosis risk. Falls generally result from an interaction of multiple and diverse risk factors and situations, many of which can be corrected (Table 1). This interaction is modified by age, disease and the presence of hazards in the environment. Frequently older people are not aware of their risks of falling and neither recognise risk factors nor commonly report these issues.

Whilst many falls result from one-off accidental factors, slips, trips and tumbles associated with gait and balance problems are almost as common. Cardiovascular causes of falls are less frequent, with hypotension, orthostatic hypotension, carotid sinus hypersensitivity and vasovagal syncope predominating over cardiac arrhythmias. In many patients admitted to hospital with a hip fracture, the cause of the fall leading to the fracture is multifactorial, but the cause is commonly labelled as 'mechanical fall'. Consequently opportunities for the prevention of future falls are overlooked.

Table 1. (Adapted from the Guideline for the prevention of falls in older people, American Geriatrics Society, British Geriatrics Society and the American Academy of Orthopaedic Surgeons Panel on Falls Prevention[51])

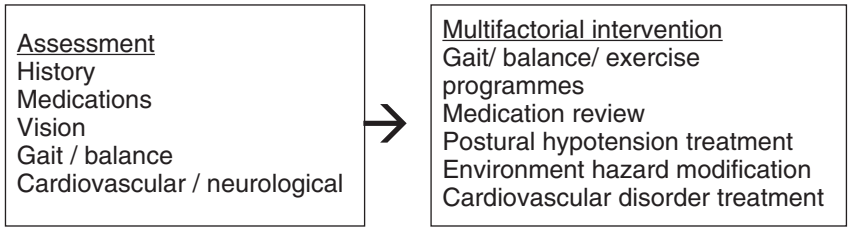
Risk Factor	Mean Significant/Total*	RR-OR**	Range
Muscle Weakness	10/11	4.4	1.5-10.3
History of Falls	12/13	3.0	1.7-7.0
Gait Deficit	10/12	2.9	1.3-5.6
Balance Deficit	8/11	2.9	1.6-5.4
Use Assistive Device	8/8	2.6	1.2-4.6
Visual Deficit	6/12	2.5	1.6-3.5
Arthritis	3/7	2.4	1.9-2.9
Impaired ADL	8/9	2.3	1.5-3.1
Depression	3/6	2.2	1.7-2.5
Cognitive Impairment	4/11	1.8	1.0-2.3
Age > 80 Yrs	5/8	1.7	1.1-2.5

* Number of studies with significant odds ratio or relative risk ratio in univariate analysis/total number of studies that included each factor.

** Relative risk ratios (RR) calculated for prospective studies; odds ratios (OR) calculated for retrospective studies.

All older patients presenting to the orthopaedic unit (either as an inpatient or to the fracture clinic) with a fall and a fracture require a multidisciplinary falls risk assessment (Figure 2).

Figure 2. Adapted from the NICE Falls guidance[52]



A detailed history of the circumstances leading to the fall, including enquiry into previous falls is vital, as the description of the fall will allow examination and investigation to be most effective. Many of the recommended elements of effective falls assessment will automatically form part of the rehabilitation process, in particular in those admitted to hospital with a fracture.

Different members of the multidisciplinary team can focus on:

- Gait and balance disorders
- Optimising mobility
- Appropriate walking aids and footwear
- Home environment hazard modification
- Assessment of vision, cognition and continence

A small proportion of patients will require specialist assessment and targeting to specialist attention – for example in syncope clinics. However, these assessments are commonly not undertaken in the fracture clinic setting and clearly patients need to be identified and referred on to appropriate falls pathways/falls services currently available. The risk factors identified in the assessment may be modifiable (such as muscle weakness, medications side-effects) or non-modifiable (such as hemiplegia, uncorrectable visual impairment). Knowledge of all risk factors is important for treatment planning.

2.3 The role of primary care

Primary care teams excel at delivery of chronic disease management. Given our proposal of a new paradigm of osteoporosis – where fractures are seen as the acute exacerbation of the chronic underlying disease of osteoporosis – the primary care team will play an increasing role in both post-acute care and secondary prevention.

A parallel with ischaemic heart disease is illustrative: following acute care of an acute coronary event, the primary care team take over the long-term management of the underlying hypertension, hyperlipidaemia, heart failure, or angina, aiming to prevent future cardiac events or death.

In exactly the same way, when patients present with fractures, the secondary care team would manage the acute event and, if a Fracture Liaison Service is available, investigate the need for management of underlying osteoporosis. The primary care team would then undertake regular reviews to encourage adherence and persistence with therapy, referring back into secondary care if needed for advice or further fracture.

Currently, structures and incentives do not support the potential contribution of the primary care team in the management of osteoporosis; but measures outlined in Figure 3 could improve things considerably.

Figure 3

To facilitate improved secondary prevention of fracture <u>in primary care</u>

- Inclusion of osteoporosis in the Quality and Outcome Framework of the GMS Contract
- Primary care teams – improved understanding of:
  - Importance of fracture prevention
  - Cost-effectiveness of fracture prevention/bone-sparing therapy
  - Use of bone-sparing drugs (eg Hierarchy of treatments as per NICE recommendations)
- Primary care fracture prevention champions in each Primary Care Organisation
- Copy of Fracture Liaison Service (FLS) investigation results and recommendations to GP (where FLS in place)
- Timely discharge summaries for fracture inpatients, including details of investigations and management recommendations
- Primary care involvement in post-discharge multidisciplinary rehabilitation teams or summary of care plan provided to practice promptly

The Quality and Outcome Framework

At the time of writing, osteoporosis and fractures are not included in the Quality and Outcomes Framework (QOF) of the GP Contract. Consequently practices have limited activity in these disease areas and data recording is often poor. In a cross-sectional study of 29 English Practices, of the 42,734 women aged 45 or over, 5.1% were recorded as having had a fracture and 3% had received a prescription for a bisphosphonate.[53] A questionnaire survey of 4,045 female patients aged 65 yr and over showed that of those responding (69.2% response rate) 24.3% had sustained a fracture.[54] These studies suggest that fractures are not recorded and patients are not treated.

2.4 Guidance on Best Practice

The National Service Framework for Older People set the milestone for all local health and care systems to have established an integrated falls service by April 2005[55]. This includes the prevention and treatment of osteoporosis as a key intervention. Furthermore the recommendations of the NICE Technology Appraisal for secondary prevention of osteoporotic fragility fractures in post-menopausal women (TA87)[16] are mandatory and should be implemented within 90 days of publication. As previously stated, Technology Appraisal 87 is currently under review to include strontium ranelate and a NICE Technology Appraisal on the primary prevention of fracture is also in development. Guidance on glucocorticoid-induced osteoporosis has been published by the Royal College of Physicians.[56]

High risk groups

In addition to those patients who have had a recent fragility fracture, three additional groups of patients will need identification and management in primary care to reduce the future fracture burden. These are:

- Those who have ever suffered a fragility fracture (fracture due to a fall from standing height or less in those aged > 50)
- Patients committed to 3 months or more of oral steroids at any age. These should be managed as recommended by the RCP 2002 Glucocorticoid-induced osteoporosis guidelines. (>65 or previous low trauma fracture then treat; under 65 and no low trauma fracture undertake DXA scan and treatment if T-score -1.5 or less)[56]
- Housebound, frail, elderly patients – especially those in care homes.

All 3 groups should be readily identifiable in primary care by simple computer searches.

Treatment

At the time of writing, NICE guidance[16] recommends that bisphosphonates are the first line treatment for post-menopausal women, with raloxifene recommended as an alternative only if bisphosphonates are contraindicated, the patient is physically unable to take them, or if there has been an unsatisfactory response to treatment. Teriparatide, a parathyroid hormone analogue, should be reserved for use by specialist centres but primary care is ideally placed to implement the remainder of the guidance (see Figure 4).

Figure 4

Secondary Prevention of Fractures[16]

Bisphosphonates should be prescribed for patients:

- 75 or over without the need for a DXA scan
- 65-74 years if osteoporosis is confirmed by DXA (T-score £2.5)
- < 65 years if:
  - T-score -3.0 SD or below
  - T-score -2.5 SD plus one or more additional age-independent risk factors

Patients need to be calcium and vitamin-D replete; if the clinician is not confident that this is the case, calcium and vitamin-D supplements should be co-prescribed

Compliance

The effectiveness of treatment for chronic conditions may be reduced by suboptimal compliance. Compliance involves:

- taking the medication correctly (e.g. after an overnight fast, with water to wash the tablet down, and a delay before any subsequent food, drinks or medication)
- 'adherence' to the medication (defined as the proportion of days for which patients have medication in their possession – the 'medication possession ratio' or MPR)
- 'persistence' (number of days from initiation of therapy to the last day of available medication).

Using the General Practice Research Database (GPRD), adherence to bisphosphonate therapy, measured by MPR, has been shown to be 74% (95% CI 73-75), with women on weekly regimes having greater adherence than women on daily regimes, 76% vs. 64%.[57] The overall mean duration of persistence with bisphosphonates is 243 days (95% CI 240-246), with women on weekly regimes faring better (249 vs. 208 days). Extending the dosing interval plus patient support has been shown to further improve persistence[58,59]. The primary health care team is well placed to monitor and encourage compliance with therapy.

Managing the workload

An average GP list of 1700 would expect 6 new fragility fractures in postmenopausal women each year, and around 40 women who have had prior fragility fractures. Although around 0.9% of the practice population will be taking oral steroids at any time[56] (2.5% in those aged 70-79 years), many of these will be using short-term therapy for respiratory disease. Around 4% of patients aged over 65 will be care home residents. Thus there will be a slow trickle of new fragility fracture patients who can be easily managed as they present, while numbers in the other high risk groups are small and can be identified and managed in primary care in bite-sized

chunks as resources allow.

The potential impact of effective secondary prevention of fracture

A 2005 US study entitled "Fracture Reduction Affects Medicare Economics" demonstrated that increased diagnosis and treatment of osteoporosis amongst women at high risk of fracture could achieve net cost savings.[60] A very recent analysis of the cost-effectiveness of the bisphosphonate, alendronate, in the treatment of women at high risk of fragility fractures in nine European healthcare systems, including the UK, identified a similarly favourable pharmaco-economic profile.[61]

Pharmaco-economic modelling shows that effective UK-wide secondary prevention has the potential to achieve cost-effective reductions in fracture incidence

Studies from the UK[3], USA[4,5] and Australia[2] have consistently demonstrated that at least one half of hip fracture patients have experienced a prior "signal"[2] fragility fracture that preceded the hip fracture episode. Accordingly, the most practical option available to the NHS to attenuate the rising incidence of hip fractures is to ensure that every patient presenting today with any fragility fracture receives effective secondary preventative care. NICE[16] has provided mandatory national guidance to inform the NHS which medications should be used to reduce fracture risk amongst postmenopausal women. Establishment of an integrated Fracture Liaison Service in every UK hospital, which operates in close collaboration with local general practice, offers the optimal system of healthcare delivery to implement NICE guidance consistently for all patients presenting with fragility fractures.

Areas for Research

Many questions remain to be answered concerning secondary prevention of fragility fractures. The following are some examples, some of which could be addressed in conjunction with NHFD :

- Confirmation of the national prevalence of a history of fragility fracture amongst patients presenting with hip fractures
- Risk factor profiling of patients presenting with hip fracture as their first fragility fracture presentation
- Improving the evidence base for the assessment and management of osteoporosis in male patients
- Determination of factors that improve adherence and persistence with therapy
- Developing and evaluating an audit-supported standard discharge summary letter to improve communication and support the implementation of secondary prevention measures
- Exploration by large-scale, long-term observational studies of clinical and health economic aspects of current and innovative bone-protection therapies

3. High quality information – using audit, standards and feedback to improve care and secondary prevention

3.1 General

This second edition of the Blue Book seeks to summarise the evidence base for good care and secondary prevention of osteoporotic fractures, with a particular focus on hip fracture.

Wide implementation of its recommendations on fracture care would improve its quality and cost-effectiveness – delivering better outcomes at lower costs – and the recommended secondary prevention strategy would, if implemented, have a useful impact on future fracture incidence.

However, since evidence-based guidance is not self-implementing, the synergy between it and continuous audit can be of value in improving care. The care that is actually delivered can – if documented by audit – be compared with what is recommended, and its processes and outcomes monitored. The availability of continuous feedback from audit offers an ongoing stimulus to the improvement of care, with audit demonstrating the impact of such efforts on outcomes.

So, together, the Blue Book and the National Hip Fracture Database (NHFD) can change the way clinical teams who look after patients with fragility fractures address the clinical and organisational challenges involved; and – by raising the profile of hip fracture by generating valid standardised information about care and outcomes – influence the way managers and health care commissioners think about the services for which they are responsible.

Hip fracture audit is already well established. Several large-scale UK hip fracture audits – most of them based on the Swedish Rikshoft audit first set up in the 1980s[1], and the subsequent EU-funded Standardised Audit of Hip fracture in Europe[2] – have emerged over the last 15 years: extensively in Scotland[3], Northern Ireland and Wales; and in many English centres (eg Peterborough, Oxford, Nottingham, Manchester, Portsmouth and Basildon).

Building on this work, the NHFD has now been developed, its launch coinciding with the publication of this Blue Book. Technologically advanced and based on the highly successful Myocardial Infarction National Audit Project (MINAP)[4], it offers participating units: a standard national dataset (with scope for the addition of local data fields); simple web-based uploading; continuous and rapid feedback; and the capacity to benchmark regularly against the national database.

NHFD is built on substantial previous work on hip fracture audit in the UK and elsewhere

Its implementation via established web-based methods lowers costs of audit and allows continuous feedback, service monitoring and national benchmarking of hip fracture care.

Already the experience of MINAP gives grounds for optimism about large scale web-based national audit and its effect on care and outcomes. In the care of myocardial infarction, door to needle time for thrombolytic ('clot-busting') therapy has been improved substantially (from 40% of cases within 30 minutes in 2000 to 75% within 30 minutes in 2003; and prescribing of recommended medication has been greatly increased, with an impressive resulting reduction in mortality.

The hip fracture journey of care is, of course, more complex than that for MI, and the challenge of improving care accordingly more exacting. However, experience from established audits has shown how current, specific, locally-owned data can prompt, support and monitor clinical and organisational change, with measurable improvements following.

Examples from various hospitals in Scotland – where the Scottish Hip Fracture Audit (SHFA) and the SIGN Guideline No. 56 have been available together since 2002 – include: fast-tracking through the AED, with mean time reduced from 2.5 to 1.6 hrs; theatre schedule reorganisation, with mean delay reduced from 62 to 34 hours; and the introduction of an Early Supported Discharge scheme, with the proportion of patients going straight home rising from 11% to 49% and a overall reduction in median length of stay from 20 to 14 days[5].

3.2 The NHFD Dataset and the collection and reporting of data

The standard NHFD core dataset has been developed and agreed by a sub-group of the NHFD Executive after a detailed consideration of the datasets already in use across the UK. It seeks to achieve both relative robustness and simplicity (to make data collection easier and more cost-effective) and a high degree of compatibility with the existing audits (to simplify the incorporation of a large body of existing information into the emerging database). The main additional feature is a new emphasis on prevention – for which good evidence of efficacy has emerged relatively recently.

The full core dataset can be found at the NHFD website http://www.nhfd.co.uk . The key elements of casemix, process and outcome in hip fracture care that it covers are as follows:

- Casemix: age and sex; mobility status, residential status, fracture type, and ASA score
- Process: time through AED; time to theatre; operation type; falls/bone health assessment and action
- Outcome at 30 days: residential status; mobility status; anti-resorptive therapy; mortality

The minimum dataset will be collected, entered and uploaded to the central database for analysis by designated staff, with continuous feedback being provided to participating units.

Prompt hip fracture care is good hip fracture care. The documentation of delay, and especially of pre-operative delay, is vital. Delay adds to costs and brings poorer outcomes, and NHFD participation offers routine monitoring, allowing week-on-week scrutiny of actual time to theatre – a key feature of good (or bad) care – and also offers ready evaluation of the effectiveness of measures taken to reduce it.

Good hip fracture care depends on minimising pre-operative delay, which currently varies widely across the UK, with many adverse effects. NHFD offers a ready means of:

- documenting delay
- monitoring service developments aimed at reducing it
- demonstrating the benefits for patients and services of doing so

Telephone follow-up at 30 days has been shown by SHFA to be achievable and affordable; and return home by 30 days and mobility at that time are outcomes that reflect adequacy of rehabilitation and are important, both for patients and in terms of overall cost-effectiveness of care. Both early and later mortality can be documented

through well-established data linkage agreements with the Office of National Statistics, and hence survival curve reporting for all participating hospitals can be routinely provided.

Casemix differs across hospitals, and is the most important determinant of outcomes in hip fracture care. For these reasons clinicians have welcomed the development of casemix-adjusted outcome reporting, seeing it as promoting transparency of comparisons at both regional and national level.

Where units reliably upload the core dataset, their casemix-adjusted outcomes will provide an improved measure of the true effectiveness of care: one that reflects the real challenges of providing care for more disadvantaged patients.

Central data analysis and reporting back to units via web-based audit has been shown by the MINAP project to be practical and – in comparison with paper-based methods – swift and cost-effective. When adequate data in the core dataset is returned, reports will be provided to participating hospitals, and will offer continuous benchmarking against national data as well as local trend monitoring. Key elements will include: delay in admission to orthopaedic ward; delay to surgery (with reasons documented); rates of different procedures used; length of acute stay; proportion of patients from home returning home by 30 days; mortality at 30 days; and rates of secondary prevention provision (both bone protection and falls prevention).

In addition to using the core dataset, orthopaedic units would be provided with a facility to add 'custom fields' for local use to audit topics of particular interest, or to monitor the impact of specific changes in clinical care or service provision; and for units in a position to offer longer-term follow-up, outcomes at 120 days and 1 year could be provided, and questions of longer-term functional outcome and implant survival better addressed.

Research potential of NHFD

A standardised database on hip fracture care in the UK, rapidly accumulating large numbers of cases, offers major research opportunities. The clinical network that runs NHFD could in due course address many important unresolved issues in hip fracture care, such as those relating to: preoperative delay for medical reasons; anaesthetic issues, both in general terms, and in high-risk groups; surgical dilemmas (e.g. the displaced intracapsular fracture); fracture healing and anti-resorptive drugs; effectiveness and cost-effectiveness of rehabilitation, and of preventive measures; outcomes in various risk-groups; quality of life as an outcome; and some of the many other topics raised in the 'Areas for research' sections above.

The research agenda is substantial but, as NHFD establishes itself, it will be able to address such questions with increasing authority. For many studies, time-limited collaborative, protocol-based 'sprint audits' on specific aspects of care could be designed and delivered, with rapid nationwide recruitment and the potential added

value of casemix-adjusted outcome assessment. More formal research projects, specifically funded and addressing major issues – in anaesthesia, surgery, rehabilitation and secondary prevention – could benefit greatly from a broadly-based NHFD collaboration. In the longer term, the impact of such efforts on the quality of hip fracture care in the UK and more widely could be considerable.

Implementing NHFD

NHFD, a national collaborative project jointly led by the British Orthopaedic Association and the British Geriatrics Society, has already attracted substantial funding to support its first year of work. The core data set has been agreed, and further preliminary work has been carried out at the time of writing. Agreement to upload data from existing audits has been obtained and an initial NHFD national database has now been established. Further information on how to participate in the NHFD can be found on their website www.nhfd.co.uk

As a national audit project, NHFD is supported by The Information Centre for Health and Social Care's National Clinical Audit Support Programme (NCASP) and the Central Cardiac Audit Database (CCAD) – the unit within it responsible for the highly successful MINAP project.

NHFD's web-based technology will support a potentially nation-wide audit with low central costs. Website access will facilitate participation by newly joining units, which – again on the basis of MINAP experience – is quite straightforward.

Data collection and its funding are a local responsibility, and – on the basis of the experience of existing audits – are best organised via specialist nurses with trauma experience, whose role can be active both in hip fracture care and in the quality assurance of that care.

An experienced trauma nurse can combine NHFD data collection with a follow-up and quality control role. Except in the largest units, participation in, or supervision of, clinical care will also be possible.

Data on patient details, timing and nature of surgical care and any complications are collected at ward level, and follow-up at 30 days can be carried out by telephone inquiry or interview.

Regular data upload to the central website will result in prompt delivery of updated local reports, which will be followed in due course by more public regional and national reports. Again on the MINAP model, a national steering group consisting mainly of clinicians will have responsibility for data ownership and confidentiality, data analysis and public reporting, and research access. A small NHFD core group – again with clinical input – will, with CCAD staff, have responsibility for the day to day running of the project.

The purpose of NHFD is to improve both the quality and cost-effectiveness of patient care following hip fracture – the tracer injury for the current epidemic of fragility fractures. It will do this by raising awareness; by providing specific, current, locally-owned data with national benchmarking; by comparing casemix, process and outcomes; and by generating valid evidence to promote informed debate locally, regionally and nationally. That debate – involving clinicians, managers and health care commissioners – will serve to maintain pressure for the continuous improvement of care for this important injury, which is the central challenge of the current epidemic of osteoporotic fractures.

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