Fracture Liaison Services

RESOURCE PACK

Provided as a Service to Medicine by Novartis

January 2010 SDT09000002

NOVARTIS

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Foreword

The Bone and Joint Decade, 2000 – 2010, has achieved many advances in the understanding and management of musculoskeletal disorders around the world. In the UK, one of the most significant contributions we have made to the Decade is the clarity and consensus that has been achieved about how best to deliver secondary prevention to patients who have sustained an osteoporotic fracture. The value of this increases steadily as the ageing population tends to drive the incidence of fragility fractures ever upwards. The absolute necessity of preventing as many fractures as possible is clear and the fact that preventive efforts directed at those who have already sustained a fracture are the most cost-effective is now widely accepted.

We are now as clear about what should be done to prevent further fractures as we are about what should be done after myocardial infarction (MI) to minimise the risk of further cardiovascular events. The difference is that, whereas all doctors in hospitals and in primary care have the need for secondary prevention after MI drilled into them, they are not so drilled about fragility fracture and in 75% of cases the analogous best practice is not applied.

This Resource Pack contains all you need to correct this situation in your locality, whether you are an orthopaedic surgeon, a geriatrician, a metabolic bone clinician, a GP with a special interest, a manager or a commissioner. It is a distillation of all the experience accumulated nationally and internationally since the Fracture Liaison Service (FLS) model evolved in Glasgow at the start of the decade. Experience not only of how best to serve the patients but also of how to argue for the resources to be able to do so.

We owe a great debt to Paul Mitchell, who has worked and thought hard throughout the decade about systems for secondary prevention of fracture, unflaggingly scouring the world literature and contacting hundreds of people. The chapters that follow contain the fruits of that labour and I hope you will use them to the full.

David Marsh
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Co-chair, National Hip Fracture Database

Executive summary

The burden of hip fracture on patients and the NHS

The population of the United Kingdom reached 61 million in mid-2007.[1] For the first time the number of citizens of state pensionable age exceeded the number of under 16s. The fastest growing group of the population is the over 80s; at 2.7 million individuals, or 5% of the UK total population. This sub-group has grown in number by >1.2 million since 1981. The annual number of deaths has decreased by 5% during the period 2001 to 2007. This ongoing shift in the demographic composition of the UK population will fuel an increasing burden of chronic disease amongst the elderly.

Osteoporosis is the most common chronic bone disease affecting both women and men.[2] The clinical manifestation of this disease is fragility fracture. Currently, over 300,000 fractures occur in the UK every year amongst older people, including 76,000 hip fractures.[3] Based on current trends, during the course of 3 decades, hip fracture incidence in the UK might increase from 46,000 cases in 1985 to 117,000 cases by 2016.[4] The risk of fracture increases following a prior fracture. All too often, hip fracture represents the final destination of a thirty year journey fuelled by decreasing bone strength and increasing falls risk.

National policy and clinical guidelines in the United Kingdom

Hip fracture has been estimated to cost the UK health and social care economy £1.3 Bn per year.[5] Accordingly, several national policies highlight the need to target assessment and intervention to patients at high risk of suffering hip fractures, including:

- National Service Framework for Older People. Section 6 - Falls. Mar-2001[6]
- NICE Clinical Guideline 21: Clinical practice guideline for the assessment and prevention of falls in older people. Nov-2004[7]
- NICE Technology Appraisal (TA) 161: Review of treatments for the secondary prevention of osteoporotic fragility fractures in post-menopausal women. Oct-2008[8]

In September 2007, the British Orthopaedic Association (BOA) and British Geriatrics Society (BGS) published the second edition of the "Blue Book" on care of patients with fragility fracture.[3] The Blue Book makes a case for nation-wide implementation of a systematic approach to hip fracture care and prevention. It considers an integrated approach to secondary fracture prevention for patients presenting with any fragility fracture.

In July 2009, the Department of Health in England published the Prevention Package for Older People.[9] The Prevention Package is intended to improve several aspects of NHS care for older people including falls and fractures. Four specific objectives are described; prioritised on the size of health gain:

Objective 1: Improve patient outcomes and improve efficiency of **care after hip fractures** through compliance with core standards
Objective 2: Respond to the first fracture and prevent the second – through **Fracture Liaison Services** in acute and primary care settings
Objective 3: Early intervention to restore independence – through **falls care pathways**, linking acute and urgent care services to secondary prevention of further falls and injuries
Objective 4: Prevent frailty, promote bone health and reduce accidents – through **encouraging physical activity and healthy lifestyle**, and reducing unnecessary environmental hazards

The Prevention Package includes a suite of downloadable resources intended to support service commissioners, healthcare providers and local authorities to develop new services informed by examples of best practice within the NHS.

The rationale for secondary fracture prevention

Several studies have evaluated future fracture risk associated with fractures at various skeletal sites;[10, 11] a prior fracture at any site is associated with a doubling of future fracture risk. Secondary fractures appear to occur rapidly after incident fracture.[12] The Glasgow Fracture Liaison Service established that 80% of re-fractures that occur over a 3 year follow up period, happen during the first year post-index fracture, with 50% of re-fractures having occurred during the first 6-8 months; dependent on whether the incident fracture was hip (6 months) or non-hip (8 months).[13] Long-term follow-up from the Dubbo Study in Australia demonstrated that fragility fracture patients are at increased risk of subsequent fracture for up to 10 years after the incident fracture.[14]

In 1980, US investigators reported that over 50% of patients presenting with hip fractures had experienced prior fractures.[15] Recent studies from Australia,[16] Scotland[17] and the USA[18] consistently found similar results. The Australian group coined the term "signal" fracture[16] to illustrate the opportunity presented by prior fragility fractures to trigger secondary preventative assessment and intervention, which has also been advocated by a UK consensus group.[19]

About 50% of all hip fracture cases come from the 16% of the post-menopausal female population with a history of fracture.[3,9] Secondary prevention therefore presents an opportunity to intervene in about half of all hip fracture patients. A recent prospective observational study from Southern California showed a 37% reduction in expected hip fracture rate over 3 years following the implementation of a systematic approach to secondary fracture prevention in 11 hospitals serving a population of 3.1 million patients.[20]

Current management gap and barriers to secondary fracture prevention in practice

In August 2007, the first UK national evaluation of standards of care for osteoporosis and falls in primary care was published.[21] The key findings from this study relating to secondary prevention of fragility fracture confirmed the management gap identified from previously published local audits. Only 25% of females aged over 75 years with a recorded prior fragility fracture had evidence of treatment for osteoporosis. The recorded prevalence of fragility fracture amongst females >65 years was ~15%.

Several surveys have been conducted amongst orthopaedic surgeons and GPs in the UK to explore the reasons for the lack of integrated care for fragility fracture patients.[22-24] One survey asked orthopaedic surgeons and GPs about their routine clinical practice regarding investigation of osteoporosis following a low trauma Colles fracture.[22] Respondents recognised that fragility fracture patients should be investigated for osteoporosis (81% of orthopaedic surgeons, 96% of GPs). However, the majority of orthopaedic surgeons (56%) would discharge the patient without investigating for osteoporosis. The majority of GPs would take no action (45%) or would instigate investigations only if prompted to do so by the orthopaedic surgeon (19%). Only 7% of orthopaedic surgeons and 32% of GPs would assess and/or start treatment themselves.

In November 2007, the Royal College of Physicians Clinical Effectiveness and Evaluation Unit (RCP-CEEU) published the **National Clinical Audit of Falls and Bone Health for Older People.**[25]

The key findings are shown in Table 1 below.

Key Findings	Hip Fracture Patients	Non Hip Fracture Patients
Received clinical osteoporosis assessment	35%	19%
65-74 year old patients referred for DXA scan	18%	19%
Received osteoporosis treatment according to NICE TA87	42%	19%

Table 1 - National Clinical Audit of Falls and Bone Health for Older People 2007[25]

These results concur with findings of systematic reviews[26, 27] which have shown that compliance with secondary prevention guidelines in the absence of a systematic approach is universally low. The primary conclusion of the RCP-CEEU audit was:

"PCTs should commission a patient care pathway for the secondary prevention of falls and fractures that includes a ***Fracture Liaison Service*** *that targets the high risk group of patients presenting with a first fragility fracture"*

In March 2009, the RCP-CEEU published the second **National Audit of the Organisation of Services for Falls and Bone Health for Older People.**[28] Only 29% of NHS Acute Trusts declared that they have a Fracture Liaison Nurse in place. The main findings of this audit were:

- ❏ Opportunities to prevent recurrent falls and fractures are being missed
- ❏ Commissioning is patchy, rarely providing a coordinated falls and fracture strategy
- ❏ Many clinical services were not adhering to NICE Technology Appraisal 87[29] on osteoporosis treatments or Clinical Guideline 21[7] on falls management

One of the main recommendations of the RCP-CEEU 2009 organisational audit re-states the conclusion of the 2007 clinical audit i.e. that Primary Care Organisations should commission a Fracture Liaison Service using the established evidence based model.

Fracture Liaison Services: a systematic approach to secondary fracture prevention

The Fracture Liaison Service (FLS) is a multi-disciplinary service that assumes responsibility for the secondary prevention of osteoporotic fractures by fracture case-finding in inpatients and outpatients, assessing and performing diagnostic evaluations, including axial DXA, with a view to making specific treatment recommendations. The service is usually delivered by a dedicated nurse specialist working within the orthopaedic environment under the guidance of a specialist in metabolic bone disease. The fracture liaison nurse ensures that every fracture patient over 50 years (excluding high trauma and road traffic accident victims) receives a "one-stop-shop" osteoporosis assessment, by working to pre-agreed protocols.

FLS has been demonstrated to offer secondary preventative assessment to >95% of fragility fracture patients presenting to hospital versus 25% at centres with other service configurations.[17] The RCP-CEEU 2005 organisational audit found that 27% of NHS Trusts had established a Fracture Liaison Service.[30] In response, the BOA-BGS Blue Book[3] advocated FLS be established in every UK hospital, as a priority, because FLS is an effective mechanism to deliver DoH policy objectives.[31] The RCP-CEEU 2009 organisational audit found that the number of hospitals declaring that they have a Fracture Liaison Nurse in place was still only 29% of NHS Acute Trusts; no significant increase since the previous audit conducted 4 years prior. The RCP-CEEU audit programme thus suggests that during the 4 year life-cycle of NICE Technology Appraisal 87 very little change in service infrastructure has occurred across the NHS to implement this mandatory guidance.

The National Osteoporosis Society (NOS) has called for an end to the healthcare inequality resulting from variable access to Fracture Liaison Services across the United Kingdom.[32] The NOS Manifestos for the 4 nations published in Spring 2009 state:

"We want a Fracture Liaison Service linked to every hospital that receives fragility fractures in the UK, to ensure that every fragility fracture patient gets the treatment and care they need."

The Department of Health provided a health economic analysis of the impact of Fracture Liaison Services in the Prevention Package for Older People.[9] This analysis was based on the assumption that approximately 70% of English Primary Care Trusts, i.e. one hundred PCTs, are yet to commission a Fracture Liaison Service. Despite conservative assumptions of the benefits of FLS, the analysis concluded that the operational costs for 100 new Fracture Liaison Services would be off-set by the savings in NHS acute care and local authority funded social care resulting from fractures averted, principally of the hip.

Fracture Liaison Services are a well established, cost-effective method of delivering systematic secondary fracture prevention that offers an opportunity to intervene in 50% of future hip fracture cases.[9] In 2009, it is evident that the Department of Health,[9, 31] the National Osteoporosis Society[32] and all relevant national professional associations[3] advocate the need for universal adoption of the FLS model across the NHS. The challenge to commissioners and providers in the 70% of UK healthcare localities not yet served by an FLS is to establish a service to close the secondary fracture prevention management gap for patients presenting to local hospitals.

The purpose of this resource pack is to improve the care of fragility fracture patients, by supporting healthcare professionals to establish and develop Fracture Liaison Services within their localities.

Table of Contents

Table of Contents (continued)

1. National policy and clinical guidelines in the United Kingdom

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The organisation and delivery of healthcare across the constituent nations of the United Kingdom has diverged considerably since devolution of central government in 1998. Accordingly, healthcare policy relevant to secondary fracture prevention will be considered at an individual country level. Examples of UK-wide national guidance will be reviewed in section 1.5.

1.1 England

Structure of the NHS in England

The population of England in mid-2007 was estimated to be 51.1 million.[1] Over 17 million citizens are aged ≥50 years and nearly 4 million are ≥75 years of age. NHS policy in England is directed from the centre by the Department of Health. In 2006, 10 enlarged Strategic Health Authorities (SHAs) were formed to provide strategic leadership and hold to account the 152 English Primary Care Trusts (PCTs).[33, 34] The SHAs are in turn accountable to the Department of Health for ensuring that local healthcare is delivered in line with national policy. PCTs are responsible for commissioning services in a purchaser-provider relationship with England's 175 acute NHS Trusts[35] and other healthcare providers. The introduction in 2005 of Practice-based Commissioning (PBC) has created a mechanism for PCTs to devolve commissioning of services to individual or clusters of GP practices.

NHS Policy in England

The key policy documents relevant to secondary fracture prevention in England are:

- ❏ National Service Framework (NSF) for Older People. Section 6 - Falls. Mar-2001[6]
- ❏ NICE Clinical Guideline 21: Clinical practice guideline for the assessment and prevention of falls in older people. Nov-2004[7]
- ❏ NICE Technology Appraisal (TA) 161: Review of treatments for the secondary prevention of osteoporotic fragility fractures in post-menopausal women. Oct-2008[8]*
- ❏ Prevention Package for Older People. Falls and fractures. Jul-2009[9]

* NICE TA161 supersedes NICE TA87 (Treatments for the secondary prevention of osteoporotic fragility fractures in post-menopausal women. Jan-2005)[29]

A common theme amongst these policy documents is the need for osteoporosis and falls assessment to be provided to patients with a history of fragility fracture. Section 6 of the NSF for Older People set a standard for the management and prevention of falls. The key objective was for every health and social care system to establish an integrated falls service by April 2005. NICE Clinical Guideline (CG) 21 is concerned with the assessment and prevention of falls. In respect of organisational issues NICE CG21 recommends an integrated approach to falls prevention and osteoporosis.

In January 2005, NICE published Technology Appraisal 87[29] which made the assessment and subsequent treatment for secondary fracture prevention, where appropriate, of all females over 50 years of age with a history of fragility fracture mandatory. NICE TA87 stratified assessment and treatment strategies as a function of age and bone mineral density. Several bisphosphonates (alendronate, etidronate and risedronate) were recommended as treatment options for the secondary prevention of osteoporotic fragility fractures.

In October 2008, NICE published Technology Appraisal 161[8] which reviewed TA87 and included new guidance on the use of strontium ranelate. NICE TA161 recommends alendronate as the first-line treatment option for the secondary prevention of osteoporotic fragility fractures in women who are confirmed to have osteoporosis (i.e. T-Score -2.5 SD). The guidance states that women aged over 75 years may not require a bone density scan if deemed clinically inappropriate or infeasible by the responsible clinician. Several treatment options may be available for second-line use dependent upon age, BMD and the presence of clinical risk factors.

The NICE osteoporosis clinical guidelines programme was suspended pending publication of TA161 and TA160; the latter relates to primary prevention of fragility fracture amongst postmenopausal women.[36] Accordingly, publication of the clinical guideline is anticipated during 2010.

In July 2009, the Department of Health in England published the Prevention Package for Older People.[9] The Prevention Package is intended to improve several aspects of NHS care for older people including falls and fractures. Four specific objectives are described, prioritised on the size of health gain:

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The Prevention Package includes a suite of downloadable resources intended to support service commissioners, healthcare providers and local authorities to develop new services informed by examples of best practice within the NHS. A comprehensive analysis of the content and recommendations of the Prevention Package for Older People is provided in section 4 of this resource pack.

Future direction in England: The NHS next stage review

During summer 2008, plans for the development of the NHS were published as outputs from the NHS next stage review.[37] The 9 Strategic Health Authorities out with NHS London published strategic vision documents to outline plans and priorities for their respective regions of the NHS in England during the next decade.[38] The review of NHS London had followed a separate process and timeline. In December 2006, NHS London asked Professor the Lord Darzi of Denham to review London's healthcare resulting in the subsequent report **Healthcare for London: a framework for action** which was published in July 2007.[39]

The final report of the NHS next stage review authored by Lord Darzi was published in July 2008. The document, **High quality care for all: NHS Next Stage Review final report**,[40] responds to the SHA strategic visions and "sets out a vision for an NHS with quality at its heart." A draft NHS Constitution was simultaneously published for public consultation.[41] Publication of the constitution coincided with the 60th anniversary of the creation of the NHS. The constitution describes patients' rights and responsibilities in relation to utilisation of NHS services. The Department of Health also published **NHS Next Stage Review: Our vision for primary and community care**[42] in July 2008. This document sets out a vision for how services will grow and develop over the next ten years with a focus on continuous quality improvement.

The individual SHA vision documents were the product of a broad consultation within the local NHS. In August 2007, SHAs in England were instructed to establish 8 clinical pathway groups:

- ❏ Maternity and newborn care
- ❏ Children's services
- ❏ Acute care
- ❏ Long-term conditions
- ❏ Staying healthy
- ❏ Planned care
- ❏ Mental health
- ❏ End of life care

Each clinical pathway group prepared reports which were subsequently integrated to produce the SHA vision document. The potential for the SHA visions to impact upon delivery of secondary fracture prevention is well illustrated by objectives set out by NHS South West: [43]

- ❏ *Have a co-ordinated multi-disciplinary team approach for long-term conditions by 31 March 2010 in each locality, with a single point of access*
- ❏ *Reduce emergency bed days for people with long-term conditions by 30% from the 2006/07 baseline by 31 March 2010*
- ❏ *Reduce emergency admissions as a result of a fall by 30% from the 2006/07 baseline by 31 March 2010 through effective falls and bone health prevention programmes*

1.2 Scotland

Structure of the NHS in Scotland

The population of Scotland in mid-2007 was estimated to be 5.1 million.[1] Approximately 1.8 million citizens are aged ≥50 years and nearly 400,000 are ≥75 years of age. The Scottish Government is responsible for the NHS in Scotland. The Cabinet Secretary for Health and Wellbeing has ministerial responsibility in the Scottish Cabinet for the NHS in Scotland. There are 14 NHS Boards serving the whole of Scotland, in addition to 7 Special NHS Boards providing all-Scotland services and a common services agency.[44]

Since devolution, Scotland has diverged most from the structure of the English NHS as a result of the abolition of the "purchaser-provider" split that is central to NHS operations in England. Boards in Scotland are all-purpose organisations with responsibility to plan, commission and deliver NHS services, including services provided by GPs, dentists, community pharmacists and opticians, who are independent contractors.

NHS Policy in Scotland

In 2002, NHS Scotland published the report **Adding life to years: Report of the expert group on healthcare of older people**.[45] This report made the following 5 recommendations:

- ❏ All older people should be asked annually if they have fallen in the past year
- ❏ In those who have fallen once only, balance and gait should be assessed by the Get Up and Go Test
- ❏ All who report recurrent falls, appear unsteady or who have difficulty with the Get Up and Go Test, and all presenting to medical attention with a fall should undergo multidisciplinary evaluation
- ❏ NHS Boards should ensure that falls assessment services are available and that these provide interventions of proven effectiveness, tailored to community or care home settings
- ❏ Osteoporosis management should be an important part of any falls assessment

In 2003, the Scottish Intercollegiate Guidelines Network (SIGN) published specific guidance on osteoporosis management in the form of the SIGN guideline **Management of osteoporosis SIGN71**.[46] The guideline provides a diagnosis and treatment algorithm that makes the following recommendations:

Diagnosis:

- BMD should be measured at 2 sites
- Monitoring by DXA should only be done if the result will influence management
- Biochemical markers have no place in the diagnosis of osteoporosis
- Presence of a prior vertebral fracture informs absolute fracture risk assessment

Treatment:

- The choice of anti-resorptive drug should be determined by the patient's age and fracture site
- Calcium intake should be 1,000 mg per day for post-menopausal women

SIGN, the Scottish Medicines Consortium and the Scottish Health Council are autonomous bodies operating under the umbrella of NHS Quality Improvement in Scotland (NHS QIS). NHS QIS works in partnership with NICE to issue its Technology Appraisal Guidance to NHS Scotland, at the same time as it is issued to the health service in England and Wales. Where special implications appear to exist for implementation in Scotland, the NICE guidance will be developed to allow application in the Scottish healthcare context. At the time of writing, NHS QIS is formulating a response to TA161.

1.3 Wales

Structure of the NHS in Wales

The population of Wales in mid-2007 was estimated to be 3.0 million.[1] Approximately 1.1 million citizens are aged ≥50 years and over 250,000 are ≥75 years of age. The Government of Wales Act of 1998 gave powers over a number of areas, including health and health services, to the National Assembly for Wales. The Minister for Health and Social Services holds cabinet responsibilities for both health and social care in the Welsh Assembly Government.

Until September 2009, three regional offices of the NHS Wales Department (north, south and west, mid and east) had strategic responsibility for development of infra-structure and initiatives across multiple organisations. As with England's SHAs, the regional offices were responsible for oversight of performance management of NHS organisations in their area.

Akin to English PCTs, the 21 Local Health Boards (LHB) in Wales held commissioning responsibility for provision of both primary and secondary care services to their respective populations. Three quarters of the budget for NHS Wales was administered by LHBs. All LHBs were co-terminous with local government unitary authorities and were statutorily required to produce health, social care and well-being strategies for their localities. Cross organisational working was intended to facilitate implementation of effective integrated care pathways in Wales.

In October 2009, plans to re-structure the NHS in Wales were implemented by the Welsh Assembly Government. Details of the proposed changes are available at https://www.nhsdirect.wales.nhs.uk/healthinformation/localhealthboards/

NHS Policy in Wales

The National Service Framework for Older People in Wales was published in March 2006.[47] The Falls and Fractures standard of the NSF for Wales highlights one of the health gain targets for older people in Wales which is to reduce hip fractures in the 75 and over age group by 10% by 2012. The NSF for Wales provides comprehensive guidance to Local Health Boards and NHS Trusts regarding the optimal implementation strategy for achieving this target.

The Welsh Assembly Government has an agreement in place with NICE covering the Institute's technology appraisals, clinical guidelines and interventional procedure guidance, which all continue to apply in Wales. On account of being published after NICE Technology Appraisal 87, the Welsh NSF is aligned to NICE's recommendations in respect of secondary fracture prevention.

The Welsh NSF advocates integration of falls and fracture service provision which should aim to reduce the number of falls and their impact through:

- ❏ Falls prevention
- ❏ Osteoporosis management
- ❏ Care after a fall or fracture

Osteoporosis management should be prioritized to those with prior fragility fractures or where major risk factors are present. Specifically, the Welsh NSF states:

> *"All older people presenting with a low trauma fracture or exhibiting high risk for osteoporotic fracture should be considered for treatment of osteoporosis, or for assessment of their bone mineral density (BMD). Those identified as having osteoporosis should be offered appropriate therapeutic interventions."*

The NSF advocates the following key attributes of the ideal orthogeriatric service model:

- ❏ Integration with other local falls and fractures services
- ❏ Leadership in assessment of co-existing medical, psychological and social problems
- ❏ Assessment of the patient's risk of falls and osteoporosis and advise on secondary prevention
- ❏ Provision of advice in respect of rehabilitation and discharge planning
- ❏ Promoting the development of expedited discharge pathways including intermediate care services

1.4 Northern Ireland

Structure of the NHS in Northern Ireland

The population of Northern Ireland in mid-2007 was estimated to be 1.8 million.[1] Approximately 530,000 citizens are aged ≥50 years and over 110,000 are ≥75 years of age. Devolution was restored to the Northern Ireland Assembly in May 2007. Consequently, healthcare policy has been undergoing major development. The Health and Social Care Reform Bill was introduced in June 2008 and is on target for implementation from April 2009.[48] The key elements of the legislation are:

- A new Regional Health and Social Care Board that will focus on financial management, performance management and commissioning
- A new Regional Agency for Public Health and Social Well-being to create better inter-sectoral working to tackle health promotion and inequalities and help realise the shared goal of a better and healthier future for all
- The establishment of five Local Commissioning Groups to cover the same geographical areas as the five Health and Social Care Trusts
- A smaller, more sharply focused Department
- A regional support services organisation that will provide a range of support function for the health and social care service
- A new Patient and Client Council
- Increased democratisation through local government representation on key bodies and improved partnership working

NHS Policy in Northern Ireland

Northern Ireland's Clinical Resource Efficiency Support Team (CREST) published **Guidance on the Prevention and Treatment of Osteoporosis** in 2001.[49] Subsequently, the report **Ringing the changes: A strategy for older people**[50] was published in 2002 and recommended that action was required in respect of falls and associated injuries.

Following a review of audit arrangements in Northern Ireland in 2005, in August 2007, the Regional Multi-professional Audit Group (RMAG), the Northern Ireland Audit Advisory Committee (NIRAAC) and CREST were amalgamated to form the Guidelines and Audit Implementation Network (GAIN - http://www.gain-ni.org/). GAIN is responsible for commissioning audits and developing guidelines in Northern Ireland which correlate to regional priorities, local care gaps and safety issues.

1.5 Guidance applicable throughout the United Kingdom

In 1999, the Royal College of Physicians (RCP) published clinical guidelines for the prevention and treatment of osteoporosis.[51] The RCP guidelines recommended assessment and treatment, where appropriate, for patients aged over 45 years with a history of prior fragility fracture.

In 2007, the British Orthopaedic Association (BOA) and British Geriatrics Society (BGS) published the second edition of the Blue Book on care of patients with fragility fracture.[3] The Blue Book makes a case for nation-wide implementation of a systematic approach to hip fracture care and prevention. Chapter 1 focuses on surgical aspects and models of ortho-geriatric care, primarily for hip fracture patients. Chapter 2 considers an integrated approach to secondary fracture prevention for patients presenting with all fragility fracture types. The third chapter of the Blue Book describes the National Hip Fracture Database (NHFD) which was launched simultaneously with the Blue Book. The NHFD was developed with the benefit of substantial previous experience of hip fracture audit in regions of the UK, including the Scottish Hip Fracture Audit (SHFA), and from overseas. The SHFA has been associated with substantial reductions in length of stay. NHFD is based technologically on the highly successful Myocardial Infarction National Audit Project (MINAP).

The NHFD provides a means to deliver standards, audit and feedback to improve hip fracture care and secondary prevention. The six standards below appear in the Blue Book:

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

The Blue Book highlights the need for consistent delivery of NHFD standards 5 and 6:

> *"...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."*

In October 2008, the National Osteoporosis Guideline Group (NOGG) published **Osteoporosis: Clinical guideline for prevention and treatment**.[52] In light of the development of the World Health Organisation supported Fracture Risk Assessment Tool FRAX® algorithms to calculate an individual's 10-year probability of fracture, the stated aims of NOGG are to:

- ❏ Provide assessment thresholds for the use of BMD i.e. the fracture probabilities at which a BMD test might or might not be recommended.
- ❏ Revise intervention thresholds, based on the existing RCP case-finding strategy, to provide the fracture probability at which intervention is recommended.

The NOGG Guideline was produced with the support of the Bone Research Society, British Geriatric Society, British Orthopaedic Association, British Society of Rheumatology, Primary Care Rheumatology Society, Royal College of Physicians, Society of Endocrinology, National Osteoporosis Society, Osteoporosis 2000 and Osteoporosis Dorset.

2. Rationale for secondary fracture prevention.

2. Rationale for secondary fracture prevention

2.1 The ageing population

During the 20th century a major shift in the demographic composition of the UK population occurred as illustrated in figure 1. Life expectancy for males increased from 45 to 75 years and for females from 49 to 80 years.[53] Life expectancy at age 65 in the UK has reached its highest level ever for both men and women. Men aged 65 could expect to live a further 17.2 years and women a further 19.9 years if mortality rates remained the same as they were in 2005 to 2007.[54]

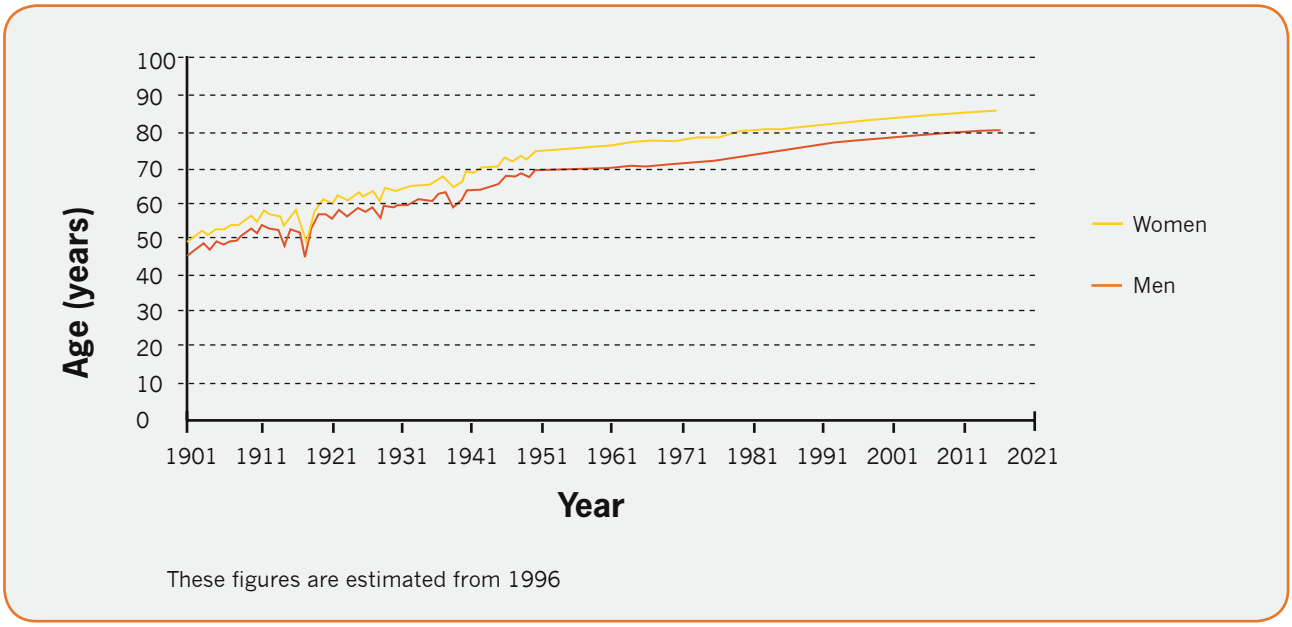

Figure 1. Life expectancy at birth during the 20th Century for the UK

2.2 Fracture as a predictor of future fracture risk

Osteoporosis is a chronic disease which is manifested in the form of fragility fractures. An illustration of the consequences of unchecked osteoporosis amongst ageing patients is provided in figure 2. As with other chronic diseases such as hypertension or hyperlipidaemia, osteoporosis sufferers experience an asymptomatic disease phase prior to occurrence of end-organ damage. Fragility fractures usually result from a fall in older patients that have compromised bone strength.

"Hip fracture is all too often the final destination of a thirty year journey fuelled by decreasing bone strength and increasing falls risk." [55]

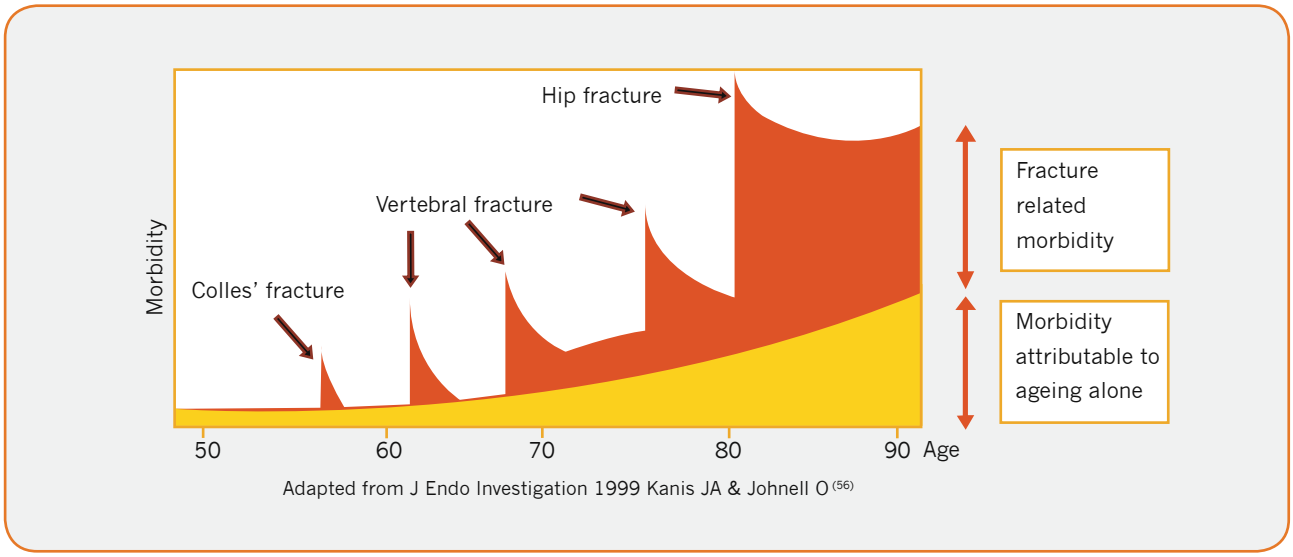

Figure 2. Fracture and quality of life during the life span of a patient with osteoporosis

As the UK population has aged, the last two decades have borne witness to a significant increase in the incidence of hip fracture. In the mid-1980s, 46,000 hip fractures occurred annually in the UK.[4] Extrapolation of the Hospital Episode Statistics for England[57] to the entire UK population suggests that 77,600 hip fractures occurred during 2007/8 which may rise to 117,000 by 2016.[4] Hip fracture has been estimated to cost the UK health and social care economy £1.3 billion per year.[5] This is likely to be conservative as the current hospital cost for hip fracture care has been shown to be of the order £12,000 i.e. double the cost used to inform the £1.3 billion estimate.[58]

As hip fracture incidence and related costs increase, the central challenge facing the NHS is how to maximise the impact of interventions that reduce rates of osteoporotic fracture. In this regard, the nature of the progression of the osteoporosis disease state provides a significant opportunity to optimally target resources. Almost three decades ago, US investigators found that more than half of patients presenting with hip fractures had experienced prior fractures.[15] More recent studies from Australia,[16] Scotland[17] and the USA[18] consistently found similar results. A prior history of fracture events occurred amongst 40% to 52% of hip fracture patients that presented to the 6 centres involved in the Scottish study. As is evident from figure 3, 45% of hip fracture patients had experienced ≥1 fracture after the age of 50 years, 18% had suffered ≥2 prior fractures and 7% had suffered ≥3 prior fractures.

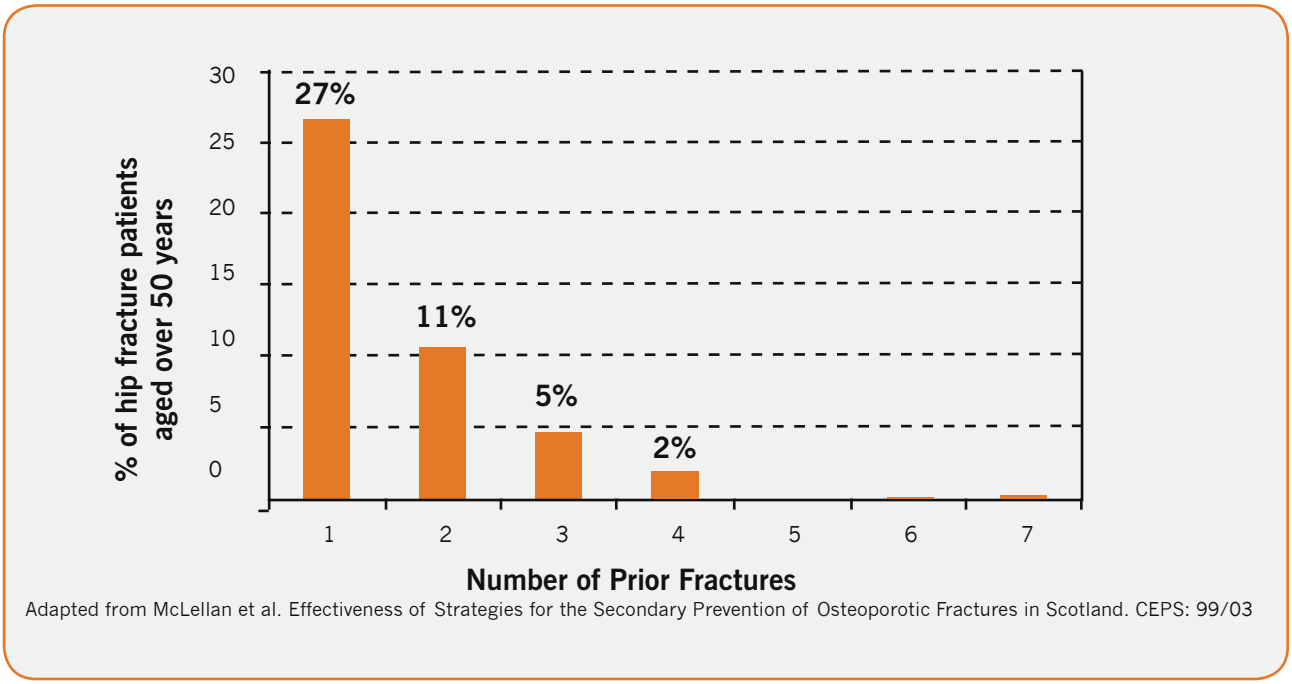

Figure 3. Prior non-vertebral and clinical vertebral fractures after age 50 amongst hip fracture patients[17]

Several studies have evaluated future fracture risk associated with fractures at various skeletal sites. Two meta-analyses[10, 11] found that a prior fracture at any site is associated with a doubling of future fracture risk; subsequent fracture risk amongst males may be higher.[12, 14, 59] Secondary fractures appear to occur rapidly after incident fracture.[12] The Glasgow Fracture Liaison Service established that 80% of re-fractures that occur over a 3 year follow up period, happen during the first year post-index fracture, with 50% of re-fractures having occurred during the first 6-8 months; dependent on whether the incident fracture was hip (6 months) or non-hip (8 months).[13] Long-term follow-up from the Dubbo Study in Australia demonstrated that fragility fracture patients are at increased risk of subsequent fracture for up to 10 years after the incident fracture.[14]

The Australian group coined the term "signal" fracture[16] to illustrate the opportunity presented to have implemented secondary preventative care immediately after the prior fracture occurred, with the aim of reducing subsequent hip fracture risk. Clearly, each of these prior signal fractures could, and should, have served as a trigger for secondary preventative assessment and intervention where appropriate.[19] The Scottish audit also found that 34% of patients with a wrist fracture and 50% of patients with vertebral fracture had a history of prior non-vertebral and/or clinical vertebral fracture.

The majority of non-vertebral fragility fractures are the result of a fall. Falls are highly prevalent amongst older people; 30% aged 65 years or over who live in the community fall each year, increasing to 45% in those aged 80 or above.[60] A recent review summarises the literature on falls epidemiology, risk factors, clinical assessment and interventions to prevent falls.[61] Up to 10% of falls result in serious injury of which 5% are fractures. Accordingly, the majority of fracture patients have fallen, whilst the minority of fallers suffer a fracture. This relationship underpins the recommendation of the BOA-BGS Blue Book that patients presenting with fragility fractures require an integrated assessment of falls risk and bone health.[3] In this regard, NICE guidance on falls (Clinical Guideline 21[7]) and osteoporosis (Technology Appraisal 161[8]) are complementary.

2.3 A systematic approach to secondary fracture prevention

In 2005, investigators from Scotland provided an estimate of the number of older females in the UK with a prior fracture history[62] at 1.3 million women. On account of a paucity of fracture prevalence studies from the UK, this estimate was primarily based upon long-term incidence data collected from a major Scottish trauma centre.[59] Studies from the UK,[62, 63] Australia[64] and France[65] suggest that the UK fracture prevalence for women over 50 years is in the range 1.3 – 2.0 million.[3] The "pyramid" of osteoporosis and fracture prevalence amongst UK women over 50 in figure 4 has been updated to reflect the mid-2007 population estimates[1] and assumes prior fracture prevalence to be 16%. This represents the mid-range of the fracture prevalence estimate provided in the 2007 BOA-BGS Blue Book[3] which was derived from pragmatic extrapolation of data from the Scottish study[62] in combination with major epidemiological studies from France[65] and Australia.[64]

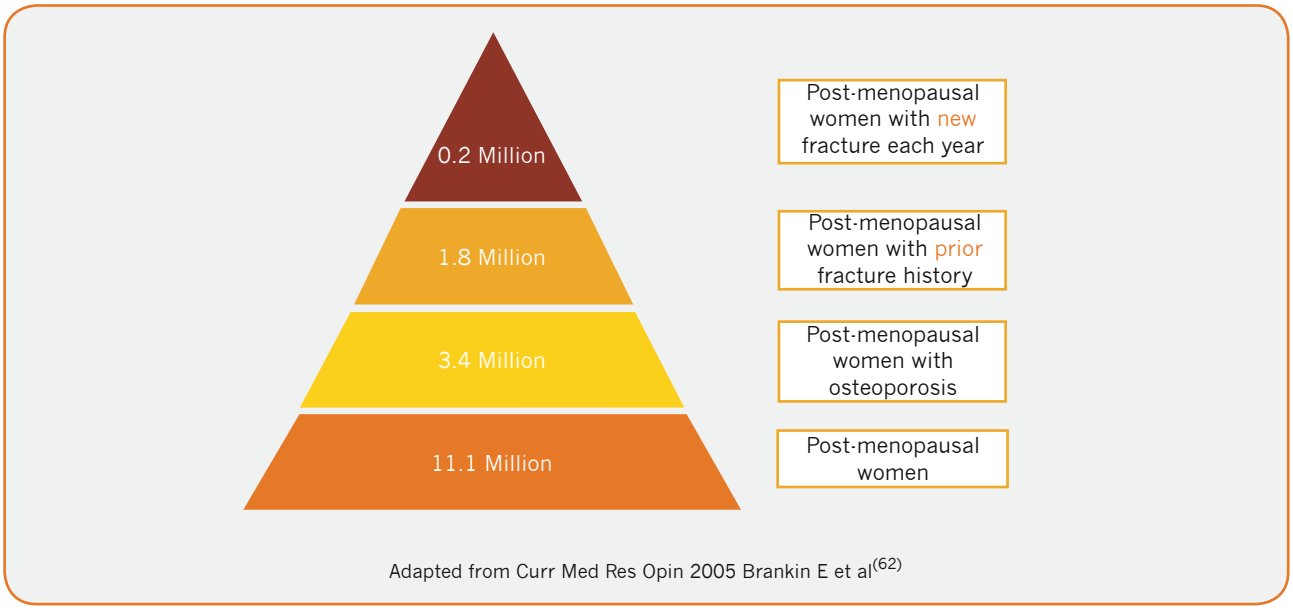

Figure 4. Estimate of osteoporosis and fracture epidemiology for the UK (Mid 2007 population)

A top down approach to case-finding of the populations illustrated in figure 4 offers a pragmatic means of targeting those at highest fracture risk in order of relative ease of identification. Patients with new symptomatic fragility fractures present to hospitals; effective systems to target these patients will be discussed in sections 4 and 5. In respect of patients that have fractured in the past but not been assessed for future fracture risk, studies have demonstrated that self-report of prior fracture events provides a means to identify this population with reasonable accuracy. Specificity of fracture self-report has been shown to exceed 80%[66-68] and under-reporting is rare.[68] Consideration of systematic approaches to identification of prior fracture patients is also given in sections 4 and 5.

During the last two decades, a range of therapeutic agents have been thoroughly assessed in multiple large-scale randomised control trials and have demonstrated consistent fracture reduction efficacy in patients with osteoporosis, including those with a history of prior fracture. A comprehensive meta-analysis of agents licensed for the treatment of osteoporosis suggests that a 50% reduction in the incidence of fractures, including hip fractures, can be achieved during three years of pharmacotherapy.[69] In January 2005, NICE published TA87[29] which mandated osteoporosis assessment for all post-menopausal female fragility fracture patients. This guidance was updated in October 2008 with publication of NICE TA161.[8]

As half of hip fracture patients have suffered prior fragility fractures, comprehensive implementation of NICE secondary prevention guidance for all new and prior fragility fracture patients would enable intervention in up to half of all future cases of hip fracture

3. Current management gap

3. Current management gap

3.1 The challenge of integrated care

Osteoporosis care of fracture patients has been characterised as a Bermuda Triangle (figure 5) comprised of orthopaedic surgeons, primary care physicians and osteoporosis experts into which the fracture patient disappears.[70] This phenomenon presents a similar challenge to management of all chronic conditions whereby end-organ damage is precipitated by worsening of an asymptomatic risk factor. In this regard, strategies for secondary prevention of fragility fractures, strokes and myocardial infarctions - as consequences of diminished bone density, uncontrolled hypertension and hyper-cholesterolaemia respectively - require analogous and comparably reliable healthcare delivery solutions.

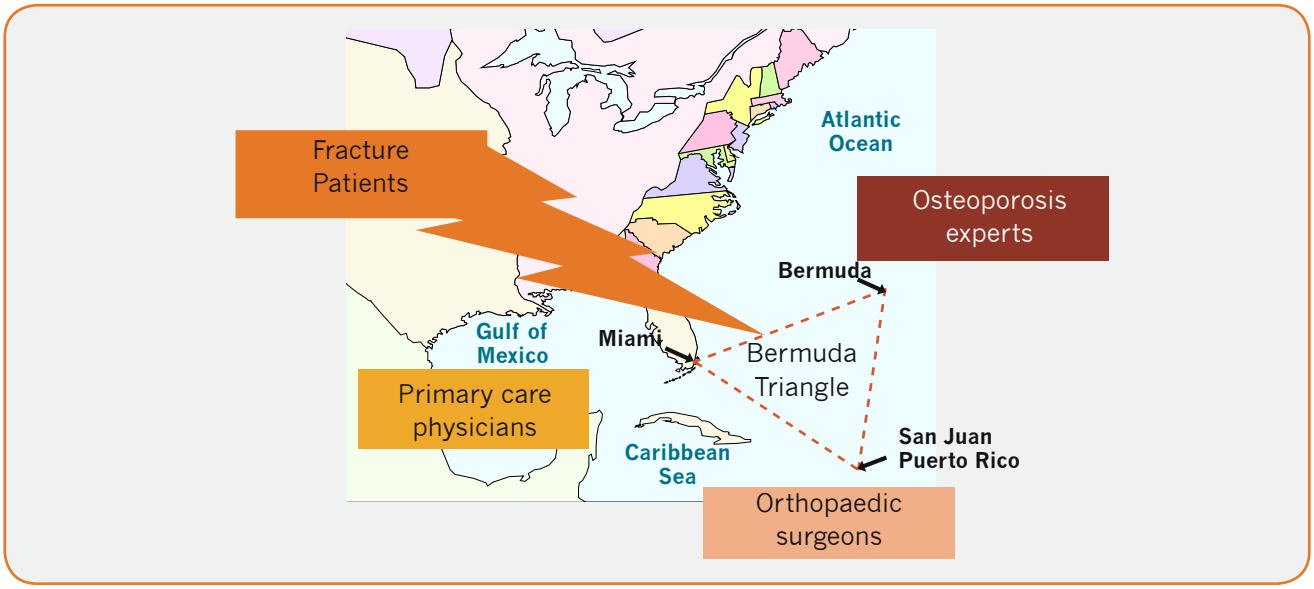

Figure 5. Osteoporosis care of the fragility fracture patient and healthcare professional "silos"[70]

3.2 National and local audits of secondary fracture prevention

3.2.1 National audits of secondary fracture protection

National evaluation of standards of care for osteoporosis and falls in primary care

In August 2007, the first UK national evaluation of standards of care for osteoporosis and falls in primary care was published.[21] The key findings from this study relating to secondary prevention of fragility fracture confirmed the management gap identified from previously published local audits:

- Only 25% of females aged over 75 years with a recorded prior fragility fracture had evidence of treatment for osteoporosis
- The recorded prevalence of fragility fracture amongst females aged over 65 years was about 15%

Other findings from the audit:

- About 10% of females aged 65-74 years with a prior fragility fracture had evidence of bone densitometry in their medical record
- 73% of 65-74 year olds with a recorded prior fragility fracture, who also had a diagnosis of osteoporosis, received treatment
- About 2% of males aged over 65 years with a recorded prior fragility fracture had evidence of bone densitometry
- 44% of males aged over 65 years with a recorded fragility fracture and diagnosis of osteoporosis were on treatment

The findings of the national evaluation in primary care applied only to the identified at risk population. On account of shortcomings in coding of osteoporosis and falls patients on primary care systems, the authors consider this may represent only 40% to 60% of the expected population.

National clinical audit of falls and bone health for older people

In November 2007, the Royal College of Physicians Clinical Effectiveness and Evaluation Unit (RCP-CEEU) published the **National Clinical Audit of Falls and Bone Health for Older People**.[25] This audit, commissioned by the Healthcare Commission, was conducted during the last quarter of 2006. It collected data upon falls and bone health assessment in 157 UK Hospital Trusts for two distinct patient groups:

Group 1: Fragility fractures – non-hip fractures

The first 40 consecutive patients aged 65 years and over attending Accident & Emergency or Minor Injury Units with a new, clinically apparent, vertebral fracture, radius and /or ulna fracture, humerus or pelvis fracture, occurring as a result of a fall.

Group 2: Fragility fractures – hip fractures

The first 20 consecutive patients aged 65 years and over attending Accident & Emergency with a fractured hip following a fall.

The key findings of the audit related to secondary fracture prevention were:

- Less than a fifth (19%) of non-hip fracture patients and approximately a third (35%) of hip fracture patients received a clinical osteoporosis assessment
- 19% of non-hip and 18% of hip fracture patients aged 65-74 years were referred for DXA scan after their fracture as required by NICE TA87
- 19% of non-hip and 42% of hip fracture patients received osteoporosis treatment in accordance with NICE TA87

In light of the findings of the national clinical audit, the RCP-CEEU made 7 key recommendations including:

- ❏ PCTs should commission a patient care pathway for the secondary prevention of falls and fractures that includes a **fracture liaison service** that targets the high risk group of patients presenting with a first fragility fracture
- ❏ PCTs should commission community or hospital based clinics which can perform the range of risk factor assessments necessary to offer an individual targeted treatment plan to reduce falls and fractures
- ❏ The Department of Health should consider supporting inclusion of osteoporosis treatment in the Quality and Outcomes framework (QOF) for primary care

National audits have consistently shown low rates of identification and treatment of patients with prior fragility fractures

National organisational audit of services for falls and bone health

The national clinical audits described above demonstrate that the majority of fragility fracture patients are slipping through the care net. In order to close the current management gap, an understanding of the healthcare infra-structure that has failed to deliver national guidance is required.

A national organisational audit of services for falls and bone health[30] was undertaken by the RCP-CEEU in 2005. This audit established that 74% of NHS Trusts reported being a part of a coordinated, integrated multi-agency service for falls. Twenty seven percent reported having a Fracture Liaison Service.

In April 2006, the Department of Health published an update on implementation of the NSF for Older People in the form of **A New Ambition for Old Age: Next Steps in Implementing the National Service Framework for Older People**.[71] This document acknowledged that the RCP-CEEU national organisational audit had identified a lack of appropriate liaison between emergency and fracture units in respect of the management of fallers that had suffered fractures. The following 5 components of an integrated falls service were advocated:

- ❏ To extend council, PCT and voluntary sector initiatives to improve exercise, balance, medicines management, environment and footwear for older people to reduce falls risk
- ❏ To improve emergency response to falls with a key role for emergency care practitioners to assess people who have fallen prior to transfer to an emergency department and mobilise intermediate care services where a need for hospital assessment is not required
- ❏ Every economy to have access to a falls assessment service for people with recurrent falls, or one fall with serious consequences
- ❏ To improve rehabilitation services for people who have lost functional ability or confidence after a fall
- ❏ To increase capacity in osteoporosis services in DXA scanning for bone density as a guide to treatment

In 2005-06, £3 million was allocated from a centrally held revenue budget for purchasing of additional DXA scans (mainly from independent sector (IS) providers) in SHAs where there were the most pressing short-falls. Capital provision of £17m was made available in 2006/7 and 2007/8 to improve NHS capacity through investment in new DXA scanning equipment.

In March 2009, the RCP-CEEU published the second **National Audit of the Organisation of Services for Falls and Bone Health for Older People**.[28] Only 29% of NHS Acute Trusts declared that they have a Fracture Liaison Nurse in place. The main findings of this audit were:

- Opportunities to prevent recurrent falls and fractures are being missed:
  - Risk assessments in A&E departments and Fracture services are inadequate
  - Services with Falls Coordinators and Fracture Liaison Nurses have better case finding systems in place to identify high risk fallers
  - Most trusts have developed inpatient falls policies, but only a third know their inpatient falls rates
- Commissioning is patchy, rarely providing a coordinated falls and fracture strategy:
  - Important public health information on fracture rates is inadequate or not collated
  - Only 39% (67/171) of commissioning trusts report being compliant with the NICE technology appraisal on secondary prevention of osteoporotic fragility fractures
- Many clinical services were not adhering to NICE Technology Appraisal 87[29] on osteoporosis treatments or Clinical Guideline 21[7] on falls management:
  - Patients with first fractures are not flagged up for secondary prevention
  - Many of the exercise programmes being provided are not evidence based
  - Too few services used patient-agreed treatment plans
  - Assessments for safety at home using a validated approach could be better

The recommendations of the RCP-CEEU 2009 organisational audit where:

- Primary care organisations (PCOs) should develop commissioning strategies that include:
  - Case finding systems in hospital and community settings to identify high risk fallers
  - Adherence to NICE treatment guidelines with monitoring by local audit
  - Clinical leaders including a consultant with job plan commitment
  - A **Fracture Liaison Service**
  - Widespread and accessible evidence-based exercise programmes
  - Targeted use of validated home safety assessments
- The Department of Health should review how it can best support these developments by:
  - Provision of advice on commissioning
  - Strengthening incentives
  - Provision of useful metrics for falls prevention, fractures and osteoporosis treatments

The RCP-CEEU has been commissioned by the Healthcare Commission to deliver a 3 year work programme to follow-up on the previous clinical and organisational audits:

- Year 1 (2008) - Round 2 of the national organisational audit (Reported in March 2009)
- Year 2 (2009) - Patient involvement questionnaires and service improvements following on from the organisational audit
- Year 3 (2010) - Repeat of the national clinical audit

The 2005 RCP-CEEU organisational audit suggested that 27% of hospitals in England had established a systematic approach to delivery of secondary fracture prevention in the form of a Fracture Liaison Service (FLS).[72]

The 2005 RCP-CEEU audit findings correlated with the results of a national survey of orthopaedic surgeons, also conducted in 2005, where only a quarter of surgeons reported the presence of an FLS in their hospital.[24]

By 2009, only 29% of hospitals in England, Wales and Northern Ireland had established an FLS.[28]

3.2.2 Local audits of secondary fracture prevention

A growing collection of local audits conducted in the UK suggest that routine provision of secondary fracture prevention occurs for a maximum of 30% of fragility fracture patients.[63, 73-82] Amongst women with a history of prior fracture in Coatbridge, Lanarkshire, 5% (43/852) had previously undergone bone densitometry and less than 10% (80/852) were receiving treatment according to Scottish national guidelines.[46] A substantial management gap was evident even amongst patients with multiple fracture history.[62, 83]

Number of women	Number of fractures	Number on treatment	% on treatment
617	1	52	8
161	2	12	7
50	3	11	22
15	4	4	27
9	5	1	11

3.3 Barriers to secondary fracture prevention in clinical practice

International Experience

Systematic review of the literature concerned with secondary fracture prevention has identified a number of barriers to consistent healthcare delivery. The 2004 publication **Practice patterns in the diagnosis and treatment of osteoporosis after a fragility fracture: a systematic review** by Elliot-Gibson and colleagues identified the following issues in the provision of secondary fracture prevention:[26]

- ❏ Cost concerns relating to diagnosis and treatment
- ❏ Time required for diagnosis and case-finding
- ❏ Concerns relating to poly-pharmacy
- ❏ Lack of clarity regarding where clinical responsibility resides

The subsequent review titled **Fragility Fractures and the Osteoporosis Care Gap: An International Phenomenon** by Giangregorio and colleagues evaluated publications from many countries including the UK.[27] The key issues identified in this study were:

- ❏ Treatment was offered more frequently for patients with vertebral fractures in comparison to patients with non-vertebral fractures
- ❏ Older patients were more likely to be diagnosed with osteoporosis yet younger patients were more likely to receive treatment
- ❏ Males were less likely to be treated than women
- ❏ Post-fracture falls assessment are not often conducted and rarely reported as an outcome of the studies

The findings of the international systematic reviews suggest that regardless of the specific structure of the particular healthcare system, fracture patients routinely fail to receive secondary preventative care. The difference between treatment rates for patients with vertebral fractures relative to those with non-vertebral fractures is notable given that the majority of vertebral fractures do not come to clinical attention.[84] The observation that younger patients are more likely to be treated would appear at odds with targeting resources to patients at highest fracture risk.

A common theme is apparent from many studies that explore barriers and solutions to delivery of secondary fracture prevention; the lack of clarity regarding where clinical ownership resides may be the primary problem.

UK Experience

Several national surveys have been conducted amongst orthopaedic surgeons and GPs in the UK to explore the reasons for the lack of integrated care.[22-24] One survey asked orthopaedic surgeons and GPs about their routine clinical practice regarding investigation of osteoporosis in 3 clinical scenarios:[22]

- ❏ A 55 year old lady with a low trauma Colles fracture
- ❏ A 60 year old lady with a vertebral wedge fracture
- ❏ A 70 year old lady with a low trauma neck of femur fracture

Respondents recognised that fragility fracture patients should in principle be investigated for osteoporosis (81% of orthopaedic surgeons, 96% of GPs). However, in the case of the Colles fracture the majority of orthopaedic surgeons (56%) would discharge the patient without requesting investigation for osteoporosis. When faced with this scenario, the majority of GPs would take no action having assumed that the orthopedic surgeons would have conducted investigations if appropriate (45%) or would instigate investigations only if prompted by the orthopaedic surgeon to do so (19%). Only 7% of orthopaedic surgeons and 32% of GPs would assess and/or start treatment themselves.

The hip fracture scenario generated similar responses; 66% of orthopaedic surgeons would discharge the patient without osteoporosis assessment whilst 40% of GPs would file the letter and a further 19% of GPs would initiate assessment only if recommended by the orthopaedic surgeon. Notably, in the case of vertebral wedge fracture a minority of orthopaedic surgeons (29%) would discharge the patient without any action to trigger assessment whilst the majority of GPs (58%) would routinely assess and/or start treatment themselves.

These findings concur with the international systematic review:

Healthcare professionals appear to associate vertebral wedge fractures with osteoporosis but fail to make the same link for non-vertebral fractures.

3.4 Compliance with National Guidance

A growing number of UK trauma teams have conducted audits to establish compliance with NICE TA87[29] and the British Orthopaedic Association guidance on secondary fracture prevention. Audits have been published by teams from Leicester,[82] Redhill,[85] Chichester,[86] Brighton,[87] Plymouth,[77] Bradford,[88] Dundee[80] and Llantrisant.[81]

Compliance with national guidance in the absence of a systematic approach to secondary fracture prevention is universally low.

The differences between the operational structures of the NHS in the four nations of the UK may be significant in relation to integrated care solutions that aim to deliver seamless care between the hospital and primary care sectors. In Scotland, the Managed Clinical Network approach lends itself to integrated care. In England and Wales the purchaser-provider divide of the internal market is likely to result in primary care commissioning services from hospitals to deliver secondary fracture prevention for patients presenting with new fragility fractures. Alternatively, primary care-led post-discharge solutions may provide an appropriate infra-structural solution to deliver effective integrated care in the English and Welsh NHS.

4. Department of Health Prevention Package for Older People

4.1 Policy objectives

4.2 A systematic approach to falls and fracture prevention: Four key objectives

4.2.1 Improving the experience of hip fracture surgery

4.2.2 Respond to the first fracture and prevent the second

4.2.3 Early intervention to restore independence and reduce future injuries

4.2.4 Prevent frailty, promote bone health and reduce accidents

4.3 Health economic impact assessment of fracture prevention interventions

4.3.1 Impact assessment of Fracture Liaison Services for new fracture patients

4.3.2 Impact assessment of Fracture Liaison Services for prior fracture patients

4.3.3 Gain in Quality Adjusted Life Years

4. Department of Health Prevention Package for Older People

In July 2009, the Department of Health in England published the Prevention Package for Older People.[9] The primary intention of the Prevention Package is to *"...raise the focus on prevention as a means of ensuring good health, well-being and independence in later life, by promoting and encouraging uptake of comprehensive health and social care services for older people."*

The Prevention Package addresses health entitlements such as flu vaccination and cancer screening, falls and fracture prevention, access to foot care services, guidance on intermediate care and progress on audiology and telecare. This section of the resource pack will focus solely on the content and recommendations made in the Prevention Package pertaining to best practice around falls prevention and effective fracture management.

4.1 Policy objectives of the Prevention Package for Older People

The Prevention Package addresses an unmet need for specific Department of Health guidance on commissioning of falls and fracture services identified by the Royal College of Physicians 2nd National Audit of the Organisation of Services for Falls and Bone Health for Older People.[28] Government intervention was deemed necessary as improving commissioning is a central government role. The Department of Health determined that the most efficient process would be to evaluate evidence and publish once on best practice for commissioning of falls and fracture services. The Department of Health established a multidisciplinary DH Falls and Fracture Working Group to develop a suite of resources intended to support service commissioners, healthcare providers and local authorities to implement the recommendations of the Prevention Package.

The policy objectives of the Prevention Package are to promote services that:

- ❏ Minimise the risk of falling
- ❏ Minimise the injury sustained by fallers by promoting bone health
- ❏ Respond effectively to the needs of people injured in falls so that they regain their optimum possible level of independence as soon as possible

The intended effects of the Prevention Package are to:

- ❏ Promote health, wellbeing and inclusion of older people by maintaining bone health and reducing the risk, and fear, of falling
- ❏ Minimise the diversion of costly and scarce NHS resources away from treatment and aftercare towards prevention

4.2 A systematic approach to falls and fracture prevention: Four key objectives

The Prevention Package is based upon four key objectives which describe the implementation of national policies or guidelines for distinct populations through specific healthcare delivery models. The four objectives, in priority order based on the size of health gain, are:

Objective 1: Improve patient outcomes and improve efficiency of **care after hip fractures** through compliance with core standards
Objective 2: Respond to the first fracture and prevent the second – through **Fracture Liaison Services** in acute and primary care settings
Objective 3: Early intervention to restore independence – through f**alls care pathways**, linking acute and urgent care services to secondary prevention of further falls and injuries
Objective 4: Prevent frailty, promote bone health and reduce accidents – through **encouraging physical activity and healthy lifestyle**, and reducing unnecessary environmental hazards

The four key objectives relate to distinct populations as illustrated in Figure 6 below. A comprehensive description of Fracture Liaison Services (FLS) is provided in section 5 of this resource pack.

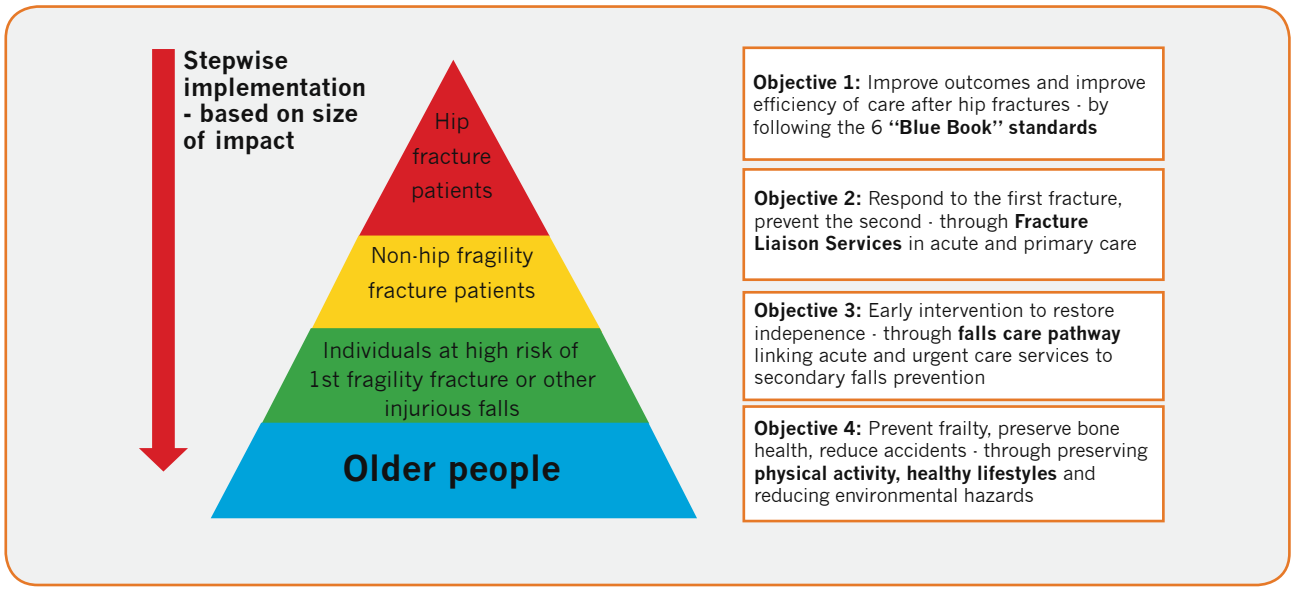

Figure 6. DH Prevention Package: Systematic approach to falls and fracture prevention

Department of Health policies, professional consensus guidelines and national audits provide recommendations which directly relate to the four distinct populations:

❑ **Hip fracture patients:**
- National Service Framework for Older People[6]
- NICE Technology Appraisal 161 - Osteoporosis secondary prevention[8]
- NICE Clinical Guideline 21 - Falls[7]
- BOA-BGS Blue Book[3]
- Royal College of Physicians national audits[25,28] and National Hip Fracture Database[3]

❏ **Non-hip fragility fracture patients:**

- National Service Framework[6]
- NICE TA161[8]
- NICE CG21[7]
- BOA-BGS Blue Book[3] and RCP national audits[25,28]

❏ **Individuals at high risk of 1st fragility fracture or other injurious falls:**

- National Service Framework[6]
- NICE Technology Appraisal 160 - Osteoporosis primary prevention[36]
- NICE CG21[7] and RCP national audits[25,28]

❏ **Older People:**

- National Service Framework[6]

The priority afforded to commissioning of services for patients with fragility fractures clearly corresponds to the weight of national policy, guidelines and audit recommendations pertinent to hip and non-hip fragility fracture patients. Each of the four key objectives is considered in more detail below.

4.2.1 Objective 1: Improving the experience of hip fracture surgery

The British Orthopaedic Association - British Geriatrics Society Blue Book on the care of patients with fragility fracture[3] defined 6 core standards of care for hip fracture patients:

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

The 2007 Royal College of Physicians National Clinical Audit of Falls and Bone Health for Older People[25] examined standards of hip fracture care based on national standards and evidence-based guidelines. The audit found *"... an unacceptable degree of variation across the NHS, and that an inadequate service is being provided by most local health services in hospital care and in prevention of future falls and fractures."*

Objective 1 of the systematic approach to falls and fracture prevention calls for improvement to outcomes and efficiency of care for post-hip fracture patients by adherence to the six Blue Book standards. The Prevention Package recommends commissioning of services which offer:

❏ An integrated ortho-geriatric service delivered to specified quality standards
❏ Post-acute care with appropriate multi-disciplinary inputs
❏ Local monitoring against the six Blue Book standards of care for hip fracture patients
❏ Continuous national quality benchmarking via the National Hip Fracture Database
❏ Consistent delivery of World Class Commissioning competencies

4.2.2 Objective 2: Respond to the first fracture and prevent the second

Objective 2 of the Prevention Package concurs with the recommendations of the BOA-BGS Blue Book[3] and the National Osteoporosis Society Manifesto:[32]

> *"The most effective way of identifying people at risk of hip fractures, and organising appropriate treatment, is to focus on two particular groups:*
> - *Patients with new fragility fractures*
> - *Patients who have fractured in the past or are at risk of osteoporotic fractures in the future"*

An illustration of bone health amongst the post-menopausal female population of an average Primary Care Trust population of 300,000 is provided as in figure 7 below. Objective 2 of the Prevention Package is based upon the rationale for secondary fracture prevention provided in section 2 of this resource pack. Because half of hip fractures have fractured before and the prevalence of prior fracture is approximately 16% amongst women over 50 years, targeting the top two strata of the pyramid through Fracture Liaison Service case-finding in both acute and primary care provides ready access to those at highest risk of suffering hip fractures.

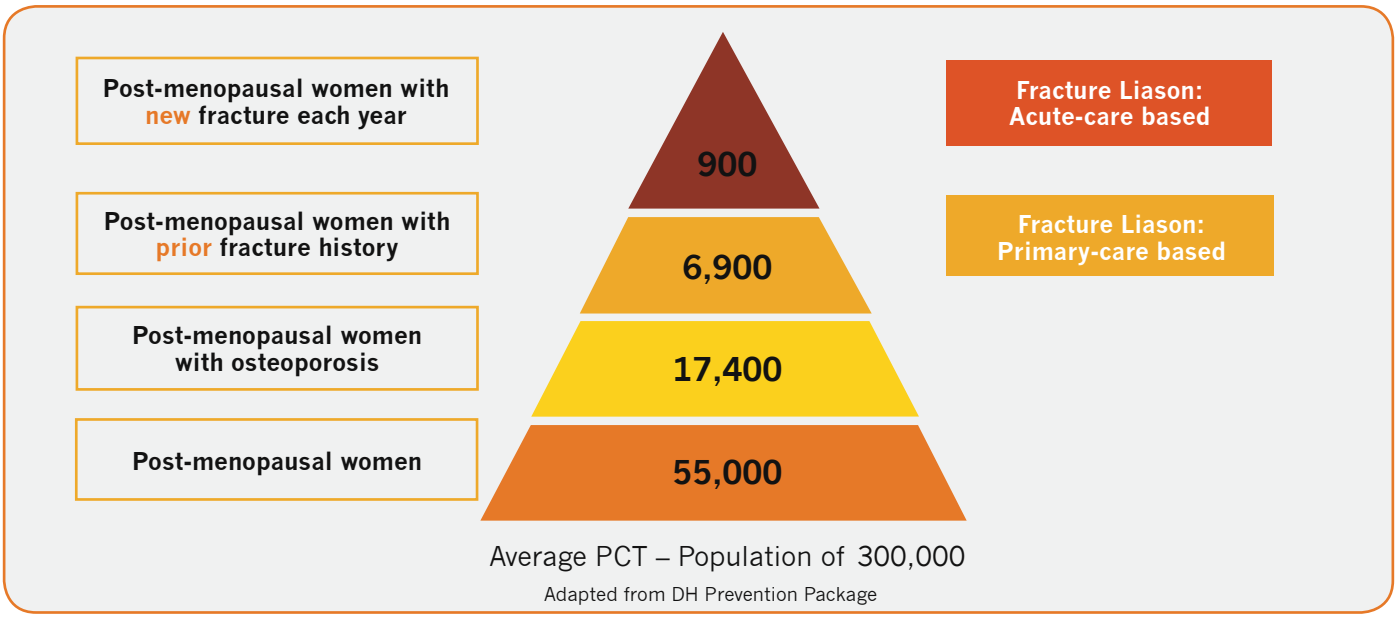

Figure 7. Pyramid of bone health amongst post-menopausal females

The Prevention Package recognises that commissioners must be conscious of the distinction, from a practical case-finding perspective, between patients presenting with new fragility fractures and those that have suffered fractures in the past. The Prevention Package highlights that national audit has demonstrated that approximately 30% of hospitals in England are currently served by a Fracture Liaison Service for patients presenting with new fractures. Based on these figures, the impact assessment of fracture prevention interventions assumes that 100 PCTs are yet to commission an FLS for new fracture patients. The nurse-led FLS model described in detail in section 5 of this resource pack is recommended in the Prevention Package to commissioners in the 100 PCTs currently lacking a service.

National and local audits discussed in sections 2 and 3 of this resource pack have demonstrated that in the absence of a systematic approach to secondary fracture prevention, patients suffering several fragility fractures, over successive years, are no more likely to have been assessed for osteoporosis than those presenting with their first fracture. This observation highlights the need and benefit of commissioning services to pro-actively case-find patients that have suffered fragility fractures in the past. To date, the majority of hospitals are not served by a Fracture Liaison Service, thus, at a national level, the majority of the prior fracture patient population have not been

assessed for future fracture risk. Accordingly, the Prevention Package recommends commissioners to establish a Fracture Liaison Service to pro-actively identify unassessed prior fragility fracture patients. The service model proposed is analogous to the model for new fracture patients i.e. a primary care-based Fracture Liaison Nurse working to pre-agreed protocols under the guidance of a GP with a specialist interest in osteoporosis. The impact assessment of fracture prevention interventions is based upon the model from Coatbridge in Lanarkshire described as a case study in section 5 of this resource pack.[62]

The Department of Health provided a health economic analysis of the impact of Fracture Liaison Services in the Prevention Package for Older People which is considered in detail in section 4.3 of this resource pack.

Despite conservative assumptions, the DH impact assessment concluded that the operational costs for new Fracture Liaison Services would be off-set by the savings in NHS acute care and local authority funded social care resulting from fractures averted, principally of the hip.

4.2.3 Objective 3: Early intervention to restore independence and reduce future injuries

Objective 3 of the Prevention Package has 4 key components:

- A falls care pathway
- A falls service and a falls co-ordinator
- Multi-factorial interventions
- Community-based therapeutic exercise

The falls care pathway should draw on the pathways for hip fracture patients and fallers with and without fragility fracture provided in the Prevention Package. A review of current arrangements should be undertaken to indentify unmet needs. The primary focus of the falls service and falls co-ordinator should be to ensure integration and co-ordination of hospital and community efforts to prevent falls. Multi-factorial interventions should be targeted on the basis of a risk assessment and will include:

- Review to optimise medication usage
- Reduce visual disability
- Eliminate unnecessary environmental hazards
- Prevent frailty, preserve bone health, promote independence

The most effective and evidence-based component of multi-factorial interventions is community-based therapeutic exercise programmes which should be tailored to the needs of hip fracture patients, non-hip fragility fracture patients and fallers who attend urgent care.

4.2.4 Objective 4: Prevent frailty, promote bone health and reduce accidents

Objective 4 promotes a joined-up strategy across local health care, social care and relevant local authority agencies through:

- Preventing falls in the community, home and hospital settings
- Tackling falls in hospitals and other care settings
- Systematic capture of information from ambulance services
- Effective use of Home Improvement Agencies and handyperson services

Objective 4 will be delivered by addressing trip hazards in the home and raising awareness amongst those with responsibility for design of the local built environment. Commissioners are recommended to consider including falls prevention metrics in contractual arrangements with local health and social care providers. The opportunity to capture information on falls from the local ambulance service, particular for patients that are not conveyed to hospital, is highlighted.

4.3 Health economic impact assessment of fracture prevention interventions

The Prevention Package includes impact assessments of specific components of the fracture prevention interventions which relate to the four key objectives and distinct patient groups as follows:

Objective 1 - Hip fracture patients:

- ❏ Adherence to Blue Book standards 5 and 6 on secondary fracture prevention delivered by a Fracture Liaison Service

Objective 2 - Non-hip fragility fracture patients:

- ❏ Adherence to Blue Book standards 5 and 6 on secondary fracture prevention delivered by a Fracture Liaison Service for:
  - Patients presenting to hospital with new fragility fractures by Fracture Liaison working with acute care
  - Patients who fractured in the past - who did not receive future fracture risk assessment at the time - and other patients at high fracture risk by Fracture Liaison working with primary care

Objective 3 - Individuals at high risk of first fragility fracture or other injurious falls:

- ❏ Community-based therapeutic exercise programmes

Objective 4 - Older People:

- ❏ Fracture risk assessment and medication for care home residents

This section will solely focus on the health economic assessment of Fracture Liaison Services working in acute care for new fracture patients and primary care for prior fracture patients.

4.3.1 Impact assessment of Fracture Liaison Services for new fracture patients

The health economic impact assessment of a Fracture Liaison Service for patients presenting to hospital with new fragility fractures is based upon the service model described in detail in section 5 of this resource pack. The service will be delivered primarily by a nurse specialist working to pre-agreed local protocols under the guidance of a hospital physician with expertise in metabolic bone disease. The role of the nurse will include:

- ❏ Case-finding of all patients aged over 50 years that present to hospital with a fragility fracture at any skeletal site
- ❏ Conduct appropriate investigations, including DXA scan, start drug and other treatments according to NICE guidance for women and local agreements for men
- ❏ Link directly with the local falls services
- ❏ Monitor and maintain medication adherence

The economic modelling is based on a PCT population of 320,000 persons. The analysis models the secondary fracture experience over a 5 year period for the 800 patients estimated to present with hip, wrist, humerus and spine fractures, during one year, to an average District General Hospital. The following assumptions are made:

- **FLS costs:** For one year - Fracture Liaison Nurse, one consultant session, clerical support, revenue costs for scanning and pharmacy costs of osteoporosis treatment for five years, usually comprised of a bisphosphonate in combination with calcium and vitamin D
- **DXA scan capacity:** 20% of hip fracture patients and 80% of wrist, humerus and spine fracture patients will be DXA scanned
- **Treatment rate:** In accordance with NICE Technology Appraisal 161,[8] approximately three-quarters of these fracture patients will receive drugs; 100% of hip, 50% of wrist, 75% of spine and 75% of humerus fracture patients
- **Drug efficacy:** In accordance with NICE Technology Appraisal 161[8], a relative risk reduction of 40% is assumed across the board i.e. all secondary fracture incidence following incident fracture at all four skeletal sites
- **Medication compliance:** Set at 80% for all treatments

The model estimates that the number of fractures that would be averted during a 5 year period for the "annual cohort" of fracture patients managed by an FLS during the first year of operations would be 18 hips, 5 wrists, 4 humerus and 6 spines. To calculate the costs of delivering FLS versus the savings from fractures averted, the following assumptions were made:

- FLS staff costs — £36,850 p.a.
- DXA costs — £20,690 p.a.
- Treatment costs — £176,641 distributed over 5 years*
- Hip fracture cost savings
  - PbR Tariff cost £10,170 per patient
  - Local authority funded social care over 2 years £3,879 per patient
  - NHS community service costs by £1,600 per community hospital admission and £400 per referral to intermediate care
- Additional PbR Tariff savings
  - Humerus fractures at £1,300 per patient
  - Spine fractures at £3,246 per patient
  - Wrist fractures at £1,082 per patient

*Assumes 12% mortality, 80% compliance and additional generic treatment options during 2010-2012

The cost for delivering the FLS for one year and subsequently treating those eligible for 5 years is £234,181. The cost savings to NHS and local authority funded social care is estimated to be £290,708, with the majority of savings being delivered within the first 3 years.

For the average PCT population of 320,000 this amounts to savings of £56,527 for every year that the FLS is operational. At a national level, this equates to approximately £8.5 million saving over 5 years.

4.3.2 Impact assessment of Fracture Liaison Services for prior fracture patients

The health economic impact assessment of a Fracture Liaison Service for patients that have suffered fragility fractures in the past - whom did not receive a fracture risk assessment at the time - is based upon the Coatbridge service model described in the case study in section 5 of this resource pack. The service will be delivered primarily by a nurse specialist working to pre-agreed local protocols under the guidance of a GP with specialist interest in osteoporosis.

The primary care-based Fracture Liaison Nurse specialist will undertake pro-active case-finding of unassessed prior fragility fracture patients and other patients at high fracture risk as time and resources permit. The primary care-based Fracture Liaison Nurse is well placed to optimise medication compliance through development of long-term management plans.

The annual operational cost for the primary care-based FLS is estimated at £195,000 for a PCT population of 300,000. The cost savings to NHS, local authority funded and privately funded social care is estimated to be £140,000.

4.3.3 Gain in Quality Adjusted Life Years

The health economic impact assessment of fracture prevention interventions also provides an analysis of gains in Quality Adjusted Life Years (QALY). This was included on the basis that *"... the opportunity cost of a QALY to the NHS may be half the value of a QALY ..."*. The QALY analysis assumes that Fracture Liaison Services in acute and primary care would avoid 2,170 hip fractures from occurring. The QALY value for hip fracture patients is set at £50,000. This would equate to benefits from QALY gains of £355 million in total. Should the opportunity cost of a QALY to the NHS translate to half the value of the QALY, this would amount to additional benefits of £177 million across England.

5. Fracture Liaison Services

5.1 Development of effective healthcare delivery using Plan-Do-Study-Act Methodology

- Case Study: The Glasgow Fracture Liaison Service – A model of care

5.2 Adoption of Fracture Liaison Services in the UK

- Case Study: The Ipswich Fracture Liaison Service
- Fracture Liaison Services in Primary Care

5.3 Setting up a Fracture Liaison Service

5.3.1 Preparatory work prior to FLS becoming operational

5.3.2 Issues to consider when FLS is operational

5.4 Optimisation of Fracture Liaison Services

5.4.1 Identification of Inpatient fracture cases by FLS

5.4.2 Identification of Outpatient fracture cases by FLS

5.4.3 Identification of vertebral fracture patients by FLS

5.4.4 Pro-active case-finding of unassessed prior fragility fracture patients

- Case Study: Case finding in primary care – The Coatbridge experience

5.5 Integrating primary and secondary care

5.6 Systematic approaches to primary fracture prevention

5.7 Delivering fracture risk reduction in the long-term

5. Fracture Liaison Services

The Fracture Liaison Service relies upon a dedicated nurse specialist working within the orthopaedic environment under the guidance of a specialist in metabolic bone disease. The specialist nurse is responsible for establishing systems of care in a particular hospital to ensure that every fracture patient over 50 years (excluding high trauma and road traffic accidents) receives a "one-stop-shop" osteoporosis assessment, with DXA where appropriate, by the nurse working to protocols devised by appropriately experienced clinicians.

5.1 Development of effective healthcare delivery using Plan-Do-Study-Act Methodology

Rapid cycle process improvement methods have been central to the development of successful new approaches to delivery of secondary fracture prevention throughout the world.

Rapid cycle process improvement methods are widely applied in the industrial sector. The method involves execution of sequential Plan-Do-Study-Act (PDSA) cycles. This approach has been applied specifically to the redesign of osteoporosis care of fragility fracture patients.[89] The steps of the PDSA cycle in the context of secondary fracture prevention are illustrated below:

Plan

- ❏ Conduct baseline audit to establish care gap
- ❏ Design prototype service to close the management gap
- ❏ Engage healthcare commissioners to fund pilot phase

Do

- ❏ Implement prototype service model
- ❏ Collect audit data throughout pilot phase

Study

- ❏ Analyse improvement in provision of care from audit
- ❏ Refine prototype service model to improve performance

Act

- ❏ Implement changes and monitor performance improvement
- ❏ Repeat PDSA cycle through continuous ongoing audit and review

CASE STUDY

The Glasgow Fracture Liaison Service – A model of care

In 1999, the Royal College of Physicians published clinical guidelines for the prevention and treatment of osteoporosis.[51] A management algorithm provided in a July 2000 update highlighted the need for assessment of patients with prior fragility fractures.[90] As illustrated in section 3, guidance from the RCP and other national bodies has not been incorporated into routine clinical practice.

Clinicians with an interest in metabolic bone disease from the Glasgow University Teaching Hospitals in Scotland identified a secondary prevention management gap in their locality.[91] To address these findings, a city-wide multi-disciplinary strategy group was formed to develop an effective and sustainable solution agreeable to all relevant stakeholders. This included representatives from:

- ❏ All relevant hospital specialities
  - Metabolic Bone Physicians (Endocrinologists)
  - Rheumatologists
  - Geriatricians
  - Orthopaedic surgeons
- ❏ Hospital strategic and financial management
- ❏ Public Health
- ❏ Regional Strategic Health Authority
- ❏ City pharmacy and medicines management groups
- ❏ Representatives of local General Practice
- ❏ Local patient representatives
- ❏ Local National Osteoporosis Society co-ordinator

During the period 1997-2000, a PDSA approach was employed to develop an optimal model for delivery of secondary fracture prevention for patients presenting to hospital with fragility fracture.

In November 1999, the first of the Glasgow hospitals established the so-called Fracture Liaison Service (FLS) which aimed to ensure that all patients over 50 years presenting with a fragility fracture would receive secondary preventative assessment and intervention where needed. The Glasgow FLS model is described in detail in 2 peer-reviewed publications.[72, 91] The operational structure of the Glasgow FLS is provided in figure 8 below.

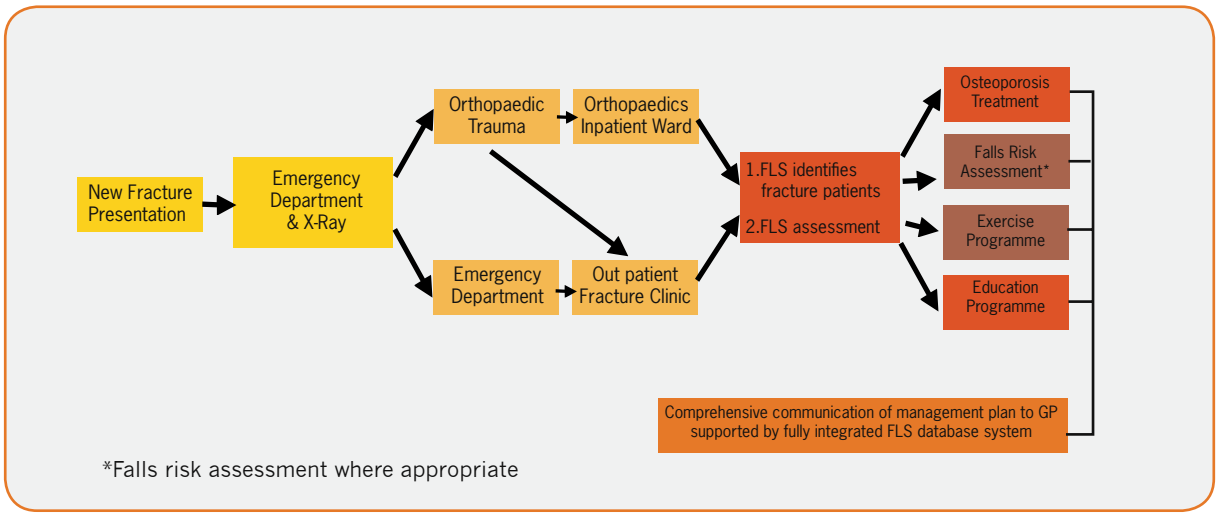

Figure 8. Operational structure of the Glasgow Fracture Liaison Service

A city-wide service based on this model has operated in Glasgow for 8 years to Q1-2009 which has resulted in >30,000 fracture patients being assessed and subsequently managed in an evidence-based fashion to reduce future fracture risk.[72] The key milestones in development of the Glasgow programme during the last decade are provided in Appendix 1.

A multi-centre national audit conducted in Scotland compared delivery of secondary prevention for fracture patients attending six hospitals with various osteoporosis service configurations:[17]

Types of service configurations

- ❏ Glasgow Fracture Liaison Service, plus specialist secondary care bone clinic, plus secondary care open access osteoporosis service and local access to axial DXA
- ❏ Specialist secondary care bone clinic plus secondary care open access osteoporosis service and local access to axial DXA (2 centres)
- ❏ Advice from Orthopaedic surgeons for fracture patients to discuss osteoporosis with GP
- ❏ Local access to quantitative ultrasound assessment only
- ❏ No structured service or access to local diagnostics

Ninety-seven percent of hip fracture patients were offered assessment and/or treatment at the centre with an FLS versus 25% at the centres with other service structures. Similarly, 95% of wrist fracture patients were offered assessment and/or treatment at the FLS centre in comparison to 21% at centres without an FLS. Accordingly, FLS has been demonstrated to achieve practically complete closure of the secondary prevention management gap for patients presenting with non-vertebral fractures. As a result the Glasgow FLS has attracted endorsement from the British Orthopaedic Association – British Geriatrics Society,[3, 92] the UK Department of Health[9, 31] and international organisations as a model of best practice to deliver evidence-based secondary preventative treatment for fragility fracture patients.[93, 94]

The 2007 edition of the British Orthopaedic Association – British Geriatrics Society Blue Book guideline on care of the fragility fracture patient identified a major opportunity to improve integrated care of the fragility fracture patient across the UK on account of only 27% of NHS Trusts in England having established an FLS by 2006.[3] The BOA-BGS Blue Book advocates that a Fracture Liaison Service be established in every UK hospital that receives patients with fragility fractures. The National Osteoporosis Society (NOS) has called for an end to the healthcare inequality resulting from variable access to Fracture Liaison Services across the United Kingdom.[32] The NOS Manifestos for the 4 nations published in Spring 2009 state:

*"We want a **Fracture Liaison Service** linked to every hospital that receives fragility fractures in the UK, to ensure that every fragility fracture patient gets the treatment and care they need."*

In 2009, it is evident that the Department of Health,[9, 31] the National Osteoporosis Society[32] and all relevant national professional associations[3] advocate the need for universal adoption of the FLS model across the NHS.

Nationwide adoption of FLS would provide a reliable mechanism to ensure that all older patients presenting with new fragility fractures receive the standards of secondary preventative care mandated by NICE to reduce future fracture risk.

5.2 Adoption of Fracture Liaison Services in the UK

Fracture Liaison Services akin to the Glasgow model had been developed in 27% of NHS Hospital Trusts prior to 2006; increasing to 29% by 2009.[24, 28, 30] This is noteworthy given that implementation of NICE Technology Appraisal 87[29] was mandatory from April 2005 until October 2008 (when TA87 was superseded by NICE TA16[8]). Several FLS teams in England have published on the set-up and/or initial audit outputs from their respective services including Ipswich,[95, 96] Peterborough,[97] Darent Valley,[98] Lewisham,[76] Cannock[99] and Leeds.[100] Furthermore, FLS has been developed in Northern Ireland and Wales, in Belfast[101] and in Aberystwyth respectively.[102]

CASE STUDY

The Ipswich Fracture Liaison Service

Implementation of a Fracture Liaison Service at The Ipswich Hospital provides an informative illustration of the process of service development for healthcare teams intent upon establishing FLS in their institution.[95, 96] Akin to the Glasgow model, the Ipswich FLS is protocol driven and primarily delivered by a Fracture Liaison Nurse with the support of the hospital's lead clinician in osteoporosis.

The Ipswich Hospital serves a population of 320,000 from which 1,250 patients over 50 years old present with a fracture on an annual basis. Over the two year period 2005-2006, the most common fracture types identified by the FLS were hip (746 cases), forearm (636 cases) and humerus (166 cases). The Ipswich team published data on fracture cases identified as a function of age - 55% from the over 70s versus 45% from 45 to 70 year olds - which highlights the opportunity for intervention amongst younger individuals presenting with fragility fractures.

The systematic approach to care and prevention of fragility fractures in Ipswich also illustrates the complementary nature of Fracture Liaison Services and Orthogeriatric Services (OGS) as advocated by the BOA-BGS Blue Book.[3]

The structure of the NHS in England described in section 1 of this resource pack is founded on a purchaser-provider internal market model. As such, it is likely that Fracture Liaison Services based in the secondary care setting will be developed through the World Class Commissioning programme with local Primary Care Trusts.[103] During 2008, several illustrations of this approach to FLS commissioning emerged. Collaboration between NHS Gloucestershire (i.e. the PCT) and the Gloucestershire Hospitals NHS Foundation Trust resulted in establishment of the Gloucestershire Fragility Fracture Liaison Service (FFLS).[104] The PCT funded the service, advertised for 2 full-time equivalent Fracture Liaison Nurse Specialists and serves as contractual H.R. manager to the nurse specialists. The Gloucestershire Hospitals NHS Foundation Trust receives fracture patients at 2 main sites as well as some community hospitals. One consultant physician in care of the elderly at each site plays the role of clinical lead for the service and also serves as clinical manager to the nurse specialists.[105] The NHS Gloucestershire FFLS is an illustration of effective service commissioning between primary and secondary care which is aligned to the aspirations of the World Class Commissioning programme and the NHS Next Stage Review.

At the time of writing, a primary care-led Fracture Liaison Service has become operational in West Sussex. The Crawley FLS will serve as a pilot programme to inform development of FLS across the entire West Sussex PCT region. The clinical team leading the Crawley programme is comprised of a GP with a specialist interest in osteoporosis and a primary care-based Fracture Liaison Nurse Specialist. The initial focus of this service is to close the management gap for patients presenting with new fragility fractures. In parallel, patients that have suffered fragility fractures in the past that failed to receive an osteoporosis and falls assessment will be targeted by the service. Monitoring of long-term persistence and adherence is planned with a particular focus on identification of treatment related side effects. The long-term goal of the Crawley FLS is to stratify risk amongst the high fracture risk sub-group of patients that are yet to suffer fragility fractures as described in the sub-section below titled **Systematic approaches to primary fracture prevention**.[106]

5.3 Setting up a Fracture Liaison Service

Critical Success Factors for establishment of a Fracture Liaison Service

The success factors common to the establishment and operation of effective Fracture Liaison Services are:

- ❏ Establishment of a multi-disciplinary strategy group from project outset
- ❏ Adequate local access to axial bone densitometry
- ❏ Appointment of a Fracture Liaison Nurse Specialist
- ❏ Protected time for input from the hospital Lead Clinician in Osteoporosis
- ❏ Agreement of assessment/management protocols with all stakeholders
- ❏ Acquisition of a database to underpin communication and audit
- ❏ Agreement of specifics of communication mechanism with primary care
- ❏ Establishment of referral mechanism from FLS to local Falls Prevention Team
- ❏ Monitoring of adherence to management recommendations issued by FLS

A summary of key activities likely to be required prior to a Fracture Liaison Service becoming operational and issues to be faced when operational are provided below.

5.3.1 Preparatory work prior to FLS becoming operational

A) Establish multi-disciplinary stakeholder group likely to include:

- ❏ NHS Hospital Trust "Lead Clinician in Osteoporosis" (Rheumatologist, Endocrinologist, Geriatrician or Orthopaedic Surgeon)
- ❏ Consultant Orthopaedic Surgeon with an interest in hip/fragility fracture surgery
- ❏ Consultant Geriatrician or Ortho-geriatrician
- ❏ National Hip Fracture Database Lead Clinician (if the Trust is registered)
- ❏ Relevant specialist nurses, physiotherapists and other Allied Health Professionals
- ❏ Personnel responsible for development/installation of FLS database
- ❏ Representatives from hospital and primary care medicines management
- ❏ Representative from local PCT and/or practice-based commissioning groups
- ❏ Representative from local General Practice
- ❏ Representative from local Public Health

B) Utilise Plan-Do-Study-Act methodology to plan initial FLS development and cycle of continuous improvement:

Plan

- ❏ Conduct baseline audit to establish care gap
  - Number of patients over 50 years attending with fragility fracture
  - Proportion of patients over 50 years receiving secondary prevention post fracture
  - Review RCP audit data
- ❏ Design prototype service to close the management gap
  - Write aims and objectives
  - Identify how you will capture fracture patients
  - Write protocols for wards and fracture clinics
- ❏ Ensure algorithms and protocols are agreed before nurse-led clinics are in place
- ❏ Agree all documentation and communication mechanisms
- ❏ Develop business case
- ❏ Engage hospital management and/or healthcare commissioners to fund pilot phase

Do

- ❏ Implement prototype service model
- ❏ Collect audit data throughout pilot phase

Study

- ❏ Analyse improvement in provision of care from audit
- ❏ Refine prototype service model to improve performance

Act

- ❏ Implement changes and monitor performance improvement
- ❏ Repeat PDSA cycle through continuous ongoing audit and review

5.3.2 Issues to consider when FLS is operational

Patient identification

- ❏ Ensure FLS notified of all patients admitted by:
  - Attending wards to see patients admitted with fragility fracture
  - Attending Trauma team meetings to discuss patients admitted to wards overnight
  - Attending designated new fracture clinics if operated

Referral pathways

- ❏ Ongoing evaluation of optimal terms to communicate the role of fracture risk assessment and falls assessment to patients

Communication with patients

- ❏ Evaluate effectiveness of delivery of information regarding lifestyle advice and modifications
- ❏ Evaluate delivery of treatment recommendations to patients – verbal and written

Compliance with medication

- ❏ Consider options for regular contact with patients to review compliance with therapy

Communication with other specialities

- ❏ Regular discussion with ward staff and multidisciplinary team
- ❏ Input into orthopaedic management plans
- ❏ Regular review of appropriate referral pathways to:
  - Metabolic bone clinic
  - Bone densitometry
  - Falls service
- ❏ Ongoing evaluation of response to letters sent to colleagues:
  - Metabolic bone clinic
  - Falls service
  - Orthopaedic surgeons

Communication with Primary care

- ❏ Ongoing evaluation of response to letters sent to GPs including information on:
  - Assessments done
  - Fracture type
  - Risk factors
  - Blood results
  - Suitable treatment
- ❏ Suggest follow-up assessment by GP at 3/6/12 months
- ❏ Consider pro-active FLS-led 6 month review of all patients via GP questionnaire and patient questionnaire if appropriate

5.4 Optimisation of Fracture Liaison Services for patient identification

The primary challenge facing healthcare professionals during establishment of a Fracture Liaison Service is how to achieve comprehensive capture of all fragility fracture patients presenting to their hospital. Accordingly, at outset, the total fracture population must be ascertained to establish the denominator for subsequent calculation of the success of the FLS in this regard.

An approximation to the likely number of patients over 50 years of age presenting to UK hospitals can be determined from national fracture epidemiology. Most recent estimates suggest that 310,000 older patients present with fracture to UK hospitals annually.[3] Based upon a UK population of 61 million individuals, this would correspond to 1,270 fracture presentations per annum to a hospital serving a population of 250,000, including 318 hip fractures.[57] Clearly, local demographics will result in variability, however, many District General Hospitals anecdotally report admitting one hip fracture patient per day suggesting that this estimate reflects real-world experience.

The 2007 RCP-CEEU national clinical audit[25] provided a snapshot of the local fragility fracture burden for most hospitals on account of the majority of NHS Trusts in England, Wales and Northern Ireland having participated in the audit.

Individual NHS Trust's contributions to the national clinical audit provide, albeit, a rather dated baseline measure of adherence to previous NICE secondary fracture prevention guidance. Importantly, the processes established to capture the national audit data could be re-used to measure current assessment rates for hip and non-hip fragility fracture patients. Publications of local audits discussed in section 3 above provide additional practical illustrations of data gathering strategies used in baseline audits.[77, 80-82, 85-88]

The optimal mechanism to ensure comprehensive capture of all fragility fracture patients will differ between hospitals on account of specifics of local orthopaedic service configuration. This underscores the need to establish a multi-disciplinary strategy group at the outset of FLS development and to maintain this group in a permanent fashion. Ongoing audit of FLS case volume will reveal fluctuations that may be attributable to seasonal variation of fracture incidence and alert the team to systems-based issues leading to fracture patients being missed by the FLS.

5.4.1 Identification of inpatient fracture cases by FLS

Case-finding systems for patients admitted to hospital that have been employed by Fracture Liaison Services include:

- ❏ Regular visits by the Fracture Liaison Nurse (FLN) to the orthopaedic wards with orthopaedic ward staff maintaining a list of fracture admissions in-between FLN visits[91]
- ❏ Attendance by the FLN at daily Trauma team meetings[95]
- ❏ Care pathway/protocol for direct referral from Orthogeriatric Services
- ❏ IT systems such as FITOS® (Fracture Intervention Tool for Orthopedic Surgeons, RioMed Limited)
- ❏ Hospital A&E admissions data

5.4.2 Identification of outpatient fracture cases by FLS

Case-finding systems for fracture patients managed as outpatients by Fracture Liaison Services include:

- ❏ Routine attendance by the FLN to fracture clinics[91]
- ❏ "Link-nurses" - Fracture clinic nurses acting as link to FLS by creating a daily register of new fracture patients[91]
- ❏ IT systems such as FITOS® (Fracture Intervention Tool for Orthopedic Surgeons, RioMed Limited)
- ❏ Hospital A&E admissions data

All patients presenting with fractures will be sent for X-Ray to confirm the fracture diagnosis. Accordingly, establishing a system with the radiology department which enables the FLN to populate a register of all patients over 50 years that have been sent for X-Ray provides a quality control metric for the FLS.

5.4.3 Identification of vertebral fracture patients by Fracture Liaison Services

The majority of non-vertebral fractures are symptomatic and result in the patient attending the Accident and Emergency department with subsequent admission to hospital or assessment as an out-patient in the fracture clinic setting. Nurse-led Fracture Liaison Services tailored to interface with local orthopaedic units provide a reliable mechanism to deliver secondary fracture prevention for patients with clinically apparent, symptomatic fragility fractures. However, publications of audit data from several FLS demonstrate that relatively few patients come to the attention of the FLS as a result of a vertebral fracture.[72, 91]

Whilst vertebral fractures are often cited as the most prevalent fracture type attributable to osteoporosis, a significant proportion does not come to clinical attention on account of several factors:[107]

- The nature of the clinical presentation of vertebral fracture
- Vertebral fractures are often overlooked on X-Rays
- Vertebral fracture can be overruled by a diagnosis with a poor prognosis
- The clinical relevance of vertebral fracture may be overlooked

Only one third of vertebral fractures are symptomatic and they frequently occur in the course of routine daily activities rather than as a consequence of a fall.[108] The IMPACT Study[109] established that underdiagnosis of vertebral fractures is a worldwide problem attributable in part to a failure of detection on X-Ray and/or the use of ambiguous terminology on the radiology report. The "Vertebral Fracture Initiative", a joint venture between the International Osteoporosis Foundation and the European Society for Musculoskeletal Radiology, was developed to address the key issues underpinning sub-optimal identification of patients with vertebral fractures. The Vertebral Fracture Teaching Program (available for down-load from http://www.iofbonehealth.org/index.php?id=574) provides a range of educational resources that will support hospital clinicians and radiologists to close this component of the secondary fracture prevention management gap.

The role of Vertebral Fracture Assessment in FLS Assessment

Assessment of patients by the combination of bone density measurement with ascertainment of vertebral fracture status has been shown to improve fracture risk prediction:[110]

"For any given BMD T-score, the risk of an incident vertebral, non-vertebral fragility, and any fracture differs by up to 12 times, 2 times, and 7 times, respectively, when information regarding spine fracture burden is considered. In the absence of knowledge about the prevalent vertebral fracture status, assessments based solely on BMD may under- or over-estimate the true risk of a patient experiencing an incident fracture."

Several barriers have been identified in relation to routine imaging of the spine by plain radiographs including cost, radiation exposure, accessibility and patient inconvenience. Accordingly, use of vertebral fracture assessment (VFA) equipment, which is commonly available on modern axial bone densitometers, provides a low radiation exposure alternative to standard X-Ray that could be conducted when patients attend for DXA scan. This approach has been explored in the Fracture Liaison Service setting.[111, 112] Amongst patients presenting with non-vertebral fractures that were assessed by an FLS, the overall prevalence of vertebral deformity was of the order of 20% to 25%.[111, 112] VFA identified a substantial burden of prevalent vertebral fractures that had not been previously documented. The proportion of non-vertebral fracture patients that would be managed differently as a result of conducting VFA was relatively small (9%[111] and 3%[112]). This is perhaps not surprising given that the patients investigated had a non-vertebral fracture which triggered FLS assessment. However, incorporation of VFA into FLS protocols has the potential to reveal two sub-groups of non-vertebral fracture patients that may be managed differently as a result of ascertainment of vertebral fracture status:

- Patients with ≥ 1 vertebral fracture and an osteopenic BMD
- Patients with multiple vertebral fractures and profoundly osteoporotic BMD

In both cases, knowledge of the presence of vertebral fractures has the potential to impact upon clinical decision making to optimise care for the individual patient's circumstances.

Another conclusion of the FLS VFA work was that VFA should ideally be conducted on all patients that are referred for DXA who do not have a clinical fracture history.[111] This concept will be explored further in the next section concerned with integration with primary care services.

Appendix 2 provides a simple questionnaire for Lead Clinicians in Osteoporosis who are currently operating an FLS, or intend to establish a service, which considers the central challenges to delivery of an effective systematic approach to secondary fracture prevention in their hospital.

5.4.4 Pro-active case-finding of unassessed prior fragility fracture patients

The majority of UK hospitals are yet to implement an FLS.[3, 9, 24, 30] Consequently, the majority of the population represented in the second stratum of the pyramid in figure 10, i.e. patients that suffered a fragility fracture in the past, did not receive intervention at the time of the acute prior fracture presentation. Accordingly, if fracture risk is to be reduced within this prior fracture population, pro-active case-finding is required, supported by local Direct Access DXA Services (DADS). To put the scale of such an undertaking into context, consider the national fracture epidemiology presented in section 2 (figure 4) and assume an average GP list includes 1,747 patients.[113] This crude analysis would suggest that every UK GP would see 6 new fracture cases per annum and have 52 prior fracture patients amongst post-menopausal women on their list.

The 2007 national evaluation of clinical standards in primary care suggests that fragility fractures are under-recorded on GP electronic systems.[21] In Coatbridge, Lanarkshire, a primary care-led programme was devised to close the management gap for unassessed prior fracture patients.[62]

CASE STUDY

Case finding in primary care – The Coatbridge experience

Objectives

- ❏ Identify all women >65 years with a fracture history amongst the population served by Coatbridge Local Healthcare Co-operative
- ❏ Conduct bone densitometry with axial DXA to identify those patients with low bone mass
- ❏ Manage patients according to Scottish national guidance (SIGN71[46])

Resources

- ❏ Mobile axial DXA scanner
- ❏ 1 FTE Primary care-based Fracture Liaison Nurse Specialist
- ❏ General Practitioner with Specialist Interest in Osteoporosis

The questionnaire in figure 9 was sent to 4045 women age 65 and over. To encourage response, a stamped addressed envelope was included. Patients were given 5 weeks to complete and return the questionnaire and the response rate was 59% (n=2386)

1. Have you ever been told by a doctor you have osteoporosis	Yes/No
If yes, have you ever had a DXA scan?	Yes/No
2. Have you ever broken (fractured) any bones after the age of 50	Yes/No
If yes, Please complete the following details	
Broken Bone	
Age at time of break	
Cause (e.g fall, traffic accident, sports injury, other)	
3. Did your mother suffer from broken bones (fractures) or was she known to have osteoporosis?	Yes/No
4. Do you have a bent, curved or hunched back (dowager's/widow's hump)?	Yes/No
5. How old were you when your:	
periods started	Age/unknown
periods stopped	Age/unknown
6. Excluding pregnancy, did your periods ever stop for more than six months before the menopause (the change)?	Yes/No
7. Have you had a hysterectomy (womb removed)?	Yes/No
8. Have you regularly taken steroid tablets e.g. Prednisolone for more than 3 months?	Yes/No
9. Please list all medication you are currently taking	
10. Do you regularly eat calcium rich foods such as milk, cheese, yogurt?	Yes/No
11. Do you regularly take some form of weight bearing exercise such as walking	Yes/No
12. Do you smoke?	Yes/No/Given up
13. Approximately how many alcoholic drinks do you have in a week?	

Figure 9. Coatbridge Programme Audit questionnaire[62]

Akin to the operational characteristics previously described for hospital-based Fracture Liaison Services, the primary care-based Fracture Liaison Nurse worked, with appropriate densitometry support, to pre-agreed protocols under the guidance of a GP with a specialist interest in osteoporosis to provide assessment and subsequent treatment recommendations for long-term management. Prior to the implementation of the programme 9% of fragility fracture patients identified were managed according to Scottish national guidelines; afterwards 64% of patients were managed in accordance with SIGN71. For the 70% of older female patients whom ultimately participated in the programme, all national policy and guidance pertinent to secondary fracture prevention that was current at the time had been implemented.[63] This included the National Service Framework for Older People (Section 6),[6] NICE Technology Appraisal 87,[29] SIGN71,[46] the 2003 BOA Blue Book[92] and the original 1999 Royal College of Physicians guidance.[51]

At the time of writing, secondary prevention of osteoporotic fracture has not been included in the Quality and Outcomes Framework (QOF) of the n-GMS contract. Whilst the previous and current NICE Technology Appraisals are mandatory, and have been published for osteoporosis since 2005, the experience from other disease areas[114] would suggest that QOF inclusion would drive significant behavioural change in UK general practice with respect to secondary prevention of osteoporotic fracture.

In October 2008, the Department of Health in England released details of a Directed Enhanced Service (DES) which offered incentives to GP practices to develop fragility fracture patient registers and implement NICE treatment recommendations.[115] Practices are required to compile audit data relating to the following:

Criterion 1: the proportion of women aged between 65 and 74 years with a history of fragility fracture in the previous 12 months who have had a diagnosis of osteoporosis confirmed by a DXA scan

Criterion 2: the proportion of women aged between 65 and 74 with a positive diagnosis of osteoporosis confirmed by a DXA scan (i.e. criterion 1) who are receiving treatment with a bone-sparing agent

Criterion 3: the proportion of women aged 75 and over with a history of fragility fracture in the previous 12 months who are receiving treatment with a bone-sparing agent.

Notably, the DES for England and a similar scheme implemented in Scotland in November 2008[116] relate specifically to initiation of secondary preventative therapy (Wales had not established a DES as of November 2009). The English and Scottish DES require GPs to create a prospective register of fragility fracture patients. This is in contrast to the scope of the recently published DES for Northern Ireland[117] on osteoporosis/secondary prevention of fractures for 2008/9 to 2010/11.

The criteria for the Northern Ireland DES are as follows:

- ❏ The contractor (GP) should develop a register of female patients aged 50 and over who have suffered at least one hip or non-hip fragility fracture to be known as the Osteoporosis/Secondary Prevention of Fractures register.
- ❏ The contractor (GP) should conduct a review for each patient to ensure all key elements of care pathway are completed. These are:
    - Assessment of the cause of the relevant fragility fracture
    - Provision of written advice on bone health and falls
    - Advice on the consultation of an optician e.g. for assessment of visual acuity, etc
    - Assessment and treatment of signs of orthostatic hypotension
    - Ensure patients are on appropriate pharmacological treatment, e.g. bisphosphonates or other bone sparing therapy
    - Referral of patients, as appropriate, for DXA scans - However patients over the age of 75 should not be referred for a DXA scan

Accordingly, if implemented throughout Northern Ireland, the DES will close the management gap for all female prior fragility fracture patients in a fashion akin to the Coatbridge Programme described above.

5.5 Integrating primary care and secondary care

The 2007 BOA-BGS Blue Book made the case that osteoporosis is a chronic disease that may afflict sufferers for multiple decades during which acute exacerbations will come to clinical attention in the form of fragility fractures.[3] As such, the development and implementation of hospital-based Fracture Liaison Services must be cognisant of the need for seamless integrated care between providers of both secondary and primary care. Long-term management of chronic conditions is the forte of the primary care team and is essential for secondary fracture prevention measures to deliver reductions in future fragility fracture incidence.

Fracture Liaison Services provide a mechanism to instigate secondary fracture prevention measures for the most readily identifiable population at high risk of future fracture at the top of the "pyramid" illustrated in figure 10.

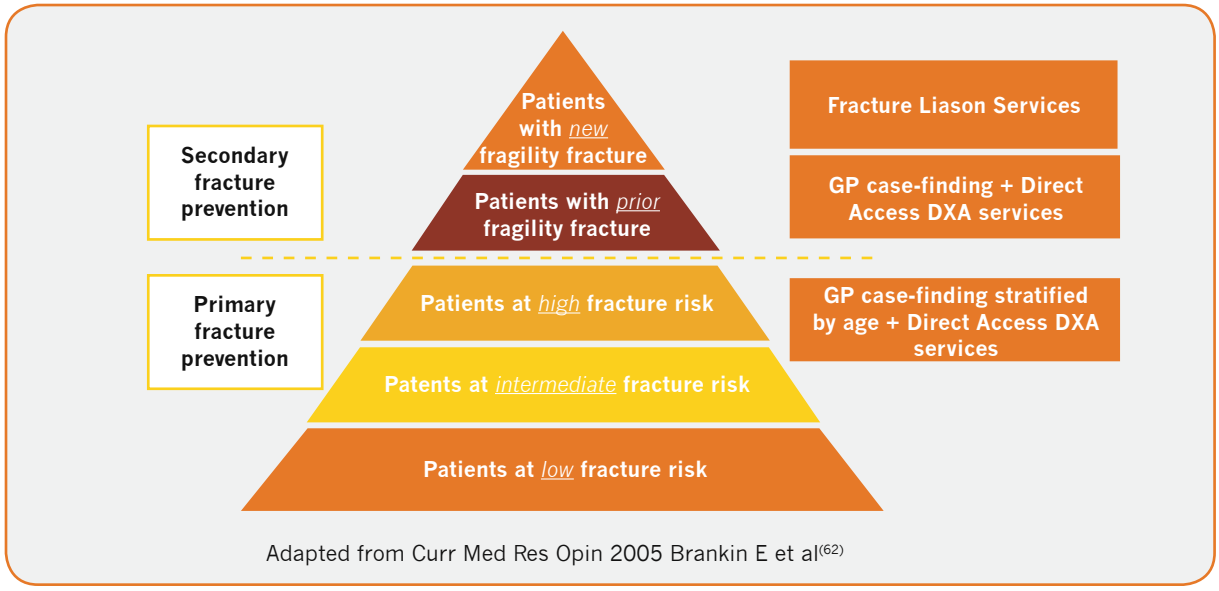

Figure 10. Prioritisation of osteoporosis assessment.

The Department of Health in England's 2009 Prevention Package for Older People[9] makes the case to establish Fracture Liaison Services in acute care to serve patients presenting with new fragility fractures and in primary care to serve the unassessed prior fracture population. The schematic in figure 11 illustrates how the Fracture Liaison Nurse model can be structured to deliver a fully integrated service.

In secondary care, new fracture patients can be identified by the FLN through A&E records and by case finding on orthopaedic/orthogeriatric wards and fracture clinic. X-ray records can also be used as an identification tool for fracture patients, as well as to validate optimum patient capture. In primary care, the FLN identifies prior fracture patients through electronic database searches and by patient questionnaires. The data obtained can be used to compile the DES in England, Scotland and Northern Ireland. The FLN provides the link between primary and secondary care to ensure that all patients identified are put through a care pathway for assessment and appropriate treatment.

Under this system, the FLN may reside in primary or secondary care, but works across both sectors. This full integrated system facilitates long term follow-up and compliance monitoring as the patient remains under the care of the FLN throughout the care pathway. Several examples of this model now exist in England with PCTs increasingly commissioning primary care based FLNs that work across both sectors.

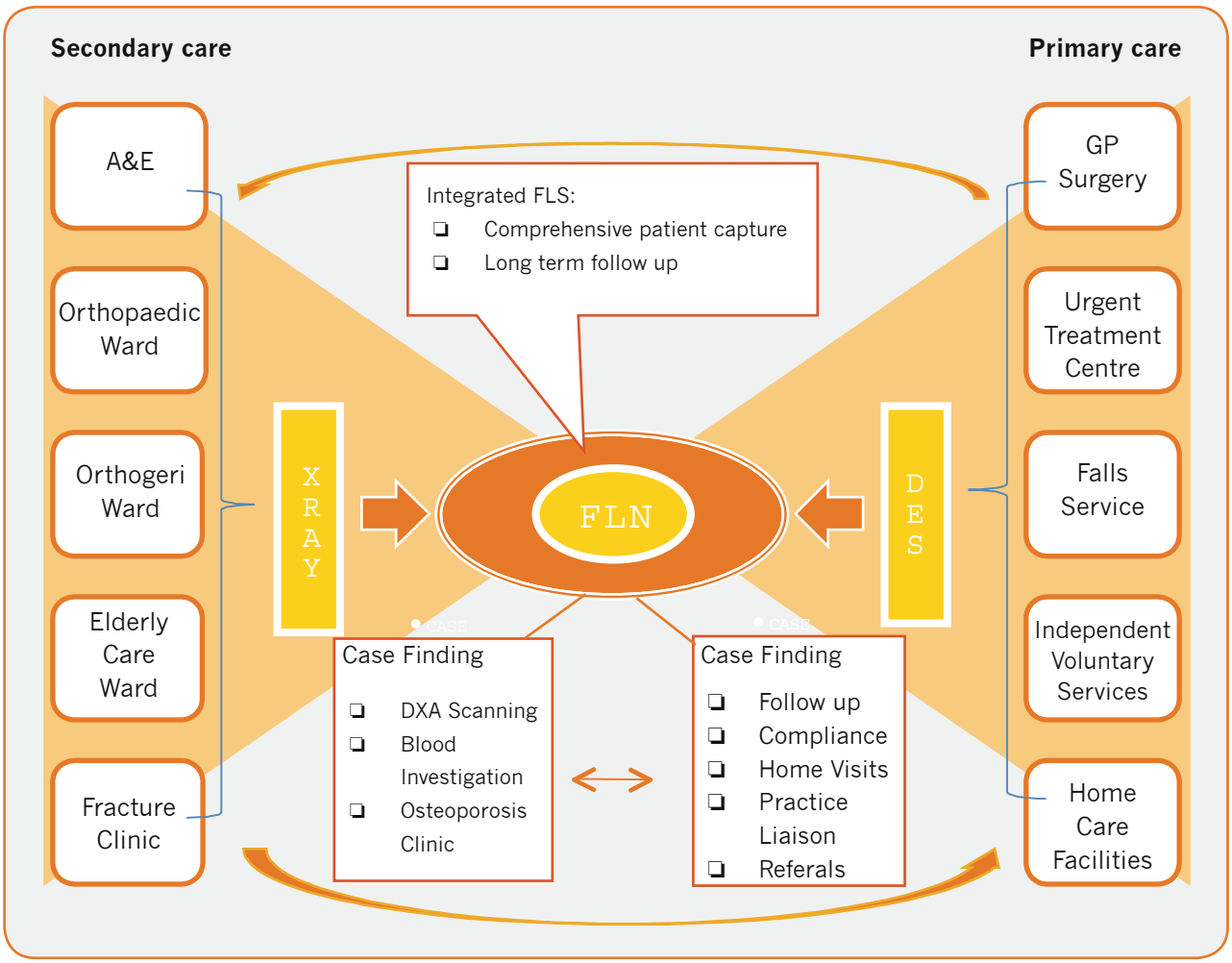

Figure 11. A fully integrated Fracture Liaison Service

5.6 Systematic approaches to primary fracture prevention

The focus of this document is upon systematic approaches to delivery of secondary fracture prevention and, as such, strategies for primary prevention are out of the current scope. In light of the current under-diagnosis and under-treatment of patients whom have already suffered fragility fractures, developing systematic approaches to close the secondary fracture prevention management gap is a priority. However, significant advances have occurred in relation to fracture risk assessment in parallel to publication of a NICE Technology Appraisal on the primary prevention of osteoporosis fragility fractures amongst post-menopausal women which merit comment.[36]

Under the auspices of the World Health Organisation, the FRAX® fracture risk algorithm has been developed to provide 10 year estimates of major osteoporotic and hip fracture risk. The FRAX® tool is available online to healthcare professionals and patients at http://www.shef.ac.uk/FRAX/.[118] Notably, there is commentary on the FRAX® website in relation to radiographically (or morphometrically) identified vertebral fractures:

> ***"Previous fracture***
> *A special situation pertains to a prior history of vertebral fracture. A fracture detected as a radiographic observation alone (a morphometric vertebral fracture) counts as a previous fracture. A prior clinical vertebral fracture from which the patient suffers consequences, is an especially strong risk factor. The probability of fracture computed may therefore be underestimated. Fracture probability is also underestimated with multiple fractures."*

This is significant in relation to the use of vertebral fracture assessment as a means of imaging the spine when patients attend for bone density measurement. Clearly, the 10 year fracture risk estimates will be significantly influenced by awareness of the presence of otherwise undiagnosed morphometric vertebral fractures. If the FRAX® tool is to be used for patients that have not suffered clinically apparent fragility fractures, vertebral fracture assessment provides a means to more accurately inform the FRAX® calculation.

A central component of the rationale for secondary fracture prevention is that half of hip fracture patients have experienced prior clinically apparent fragility fractures.[15-18] Conversely, this would suggest that half of hip fracture patients suffer a hip fracture as their first fragility fracture. Accordingly, a stratified sequential top-down approach to fracture risk assessment of the entire post-menopausal population, as illustrated in figure 10, could be undertaken as time and resources permit.

5.7 Delivering fracture risk reduction in the long-term

Healthcare providers responsible for the management of asymptomatic chronic conditions need to consider how to maximise adherence and persistence with intervention strategies in the long-term in order to optimise health gains. As is the case in management of hypertension and hyper-cholesterolaemia, adherence and persistence with osteoporosis treatments routinely diminishes to 50% within one year of initiation.[119] Several approaches have been associated with improvements in adherence and persistence to osteoporosis treatments including:

- ❏ Interaction and follow-up by an osteoporosis nurse specialist[120]
- ❏ Correct patient understanding of bone density results[121]
- ❏ Offering patients a choice of dosing interval[122]

A substantial literature has developed during the last decade on the impact of sub-optimal adherence and persistence with osteoporosis drug treatments on anti-fracture efficacy.[123-125] Many osteoporosis sufferers will experience non-hip signal fragility fractures a decade or more prior to the average age for occurrence of hip fracture.[3, 56] A primary objective of systematic approaches to secondary fracture prevention is to maximise the benefit of long-term treatment, through optimal adherence and persistence with medication, to minimise the likelihood of hip fracture being the final destination of the patient's multi-decade osteoporotic journey.[55]

6. A case for a Fracture Liaison Service

6. A case for a Fracture Liaison Service

Establishing a Fracture Liaison Service provides a mechanism to deliver a systematic approach to secondary fracture prevention through the identification of patients that have sustained a prior fragility fracture. Because half of hip fracture patients have suffered prior clinically apparent fragility fractures, **FLS provide an opportunity to intervene in half of all potential cases of hip fracture in the future**.

The 2007 BOA-BGS Blue Book on care of patients with fragility fracture states *"...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."*[3] As such, the Blue Book advocates establishment of an FLS in every UK hospital as the means to achieve this objective.

The National Osteoporosis Society also calls for universal access to FLS in the NOS Manifestoes for England, Scotland, Wales and Northern Ireland:[32]

*"We want a **Fracture Liaison Service** linked to every hospital that receives fragility fractures in the UK, to ensure that every fragility fracture patient gets the treatment and care they need."*

In the event that your hospital is yet to establish a Fracture Liaison Service, resources are provided as Appendices to support you and your colleagues to construct an FLS business case. On account of the purchaser-provider structure of the NHS in England, financial support for new and existing FLS is likely to come from a commissioning arrangement with local PCTs. This approach is advocated by the Department of Health in England's 2009 Prevention Package for Older People.[9]

The Prevention Package is intended to improve several aspects of NHS care for older people including falls and fractures. The top 2 objectives of the Prevention Package are:

Objective 1: Improve patient outcomes and **improve efficiency of care after hip fractures** through compliance with core standards (i.e. Blue Book)

Objective 2: Respond to the first fracture and prevent the second – through **Fracture Liaison Services** in acute and primary care settings

A factor common to centres across the UK that have successfully developed FLS is to establish a multi-disciplinary stakeholder group from the outset. This group will likely include:

- ❏ NHS Hospital Trust "Lead Clinician in Osteoporosis" (Usually a Rheumatologist, Endocrinologist, Geriatrician or Orthopaedic Surgeon)
- ❏ Consultant Orthopaedic Surgeon with an interest in hip/fragility fracture surgery
- ❏ Consultant Geriatrician or Ortho-geriatrician
- ❏ National Hip Fracture Database Lead Clinician (if the Trust is registered)
- ❏ Relevant specialist nurses, physiotherapists and other Allied Health Professionals
- ❏ Personnel responsible for development/installation of FLS database
- ❏ Representatives from hospital and primary care medicines management
- ❏ Representative from local PCT and/or practice-based commissioning groups
- ❏ Representative from local general practice
- ❏ Representative from local Public Health

Approximately a quarter of UK hospitals had implemented an FLS by 2009.[28] Accordingly, it is likely that Lead Clinicians in Osteoporosis working in hospitals that are yet to establish an FLS will have colleagues in neighbouring institutions that have developed a service. This point is particularly topical in England in light of the recent 2008 NHS Next Stage Review (aka The Darzi Review).

The 10 English Strategic Health Authorities (SHAs) published so-called vision plans as a local response to the national Darzi Review detailing a strategic approach to delivery of national healthcare policy across their respective geographies in the coming decade. There is potential for the SHAs to play an increasingly significant role in oversight of healthcare delivery by PCTs across their regions in the "post-Darzi" English NHS. As such, Lead Clinicians whom aspire to establish an FLS might consider gaining insights from colleagues in neighbouring NHS Trusts that have FLS in place. In parallel, Lead Clinicians might consider interacting with their local SHA Medical Director and/or Director of Public Health to explore opportunities for SHA-wide sharing of best practice as a means to reduce variability in service provision for patients of PCTs across the SHA region.

Appendices 3 to 5 are provided in electronic format to support clinicians to establish Fracture Liaison Services in their institutions:

Appendix 3 - A generic Fracture Liaison Service business plan template
Appendix 4 - A step-by-step guide to FLS development
Appendix 5 - A generic Fracture Liaison Nurse Specialist job description

The Excel spreadsheet provides readers with PubMed ID numbers which can be entered as a search term into the PubMed database at http://www.ncbi.nlm.nih.gov/pubmed/. This will direct the reader to the abstract of the paper and usually provides a link to e-publication websites. The spreadsheet categorises publications by English SHA region or devolved nation to enable the reader to identify examples of work conducted locally. The publications are classified as audits of baseline performance, integrated care pathways or services which deliver a systematic approach to secondary fracture prevention.

Appendix 1

Evolution of the Glasgow Fracture Liaison Service

Date	Key activity or milestone
1997	Formation of Glasgow Health Board Osteoporosis Strategy Group Glasgow Integrated System for Management of Osteoporosis (GISMO) database developed
1998	City-wide implementation of Direct Access DXA Service (DADS) Local audit of fracture secondary prevention after new fracture
1999	Fracture Liaison Service initiated at Glasgow Western Infirmary
2000	Fracture Liaison Service initiated at Southern General Hospital
2002	Fracture Liaison Service initiated at Glasgow Royal Infirmary
2003	Publication of Glasgow FLP Model: · *Curr Rheum Reps* Feb-2003 McLellan AR[126] · *Osteoporosis Int* Dec-2003 McLellan AR, Gallacher SJ et al[91] Endorsement of FLS in the British Orthopaedic Association Blue Book[92]
2004	Endorsement of FLS by international organisations: · *JAAOS* Nov-2004 World Orthopaedic Osteoporosis Organisation[94] · *JBJS (Br)* Sep-2004 IOF & Bone and Joint Decade[93]
2005	Additional publications from Glasgow Fracture Liaison Service: · *Injury* Sep-2005 Gallacher SJ et al; FLS vs. no FLS[79] · *BPRCR* Dec-2005 Gallacher SJ; Review on setting-up FLS[72] · CEPS Scottish secondary prevention audit McLellan AR et al[17] Endorsement of FLS by International Society for Fracture Repair
2006	Establishment of FLS for vertebral fracture patients in Glasgow Introduction of Glasgow Home Falls Service Endorsement of FLS by UK DoH Musculoskeletal Services Framework
2007	Establishment of Glasgow Hospitals Falls Service Additional publications from Glasgow Fracture Liaison Service: · *Osteoporosis Int* Jan-2007 Gallacher SJ et al; Lateral morphometry[111] · *Calcif Tissue Int* Jul-2007 Gallacher SJ et al; Re-fracture data [13] · *Clin Endo* Sep-2007 McLellan AR et al; Lateral morphometry[112] Endorsement of FLS in new British Orthopaedic Association Blue Book[3] Endorsement of FLS by IOF-BJD-ISFR Orthopaedic Surgeons Initiative

Appendix 2

FLS Status Summary

1. Fracture Liaison Service details:
    - ❏ Name of Hospital:
    - ❏ Size of population served by hospital:
    - ❏ FLS Lead Clinician:
    - ❏ Is the Fracture Liaison Nurse Specialist or Practitioner an NHS funded post?

2. When was the FLS established, or terminated if no longer operational?

3. Was a baseline audit of adherence to national secondary fracture prevention guidance conducted?
    - ❏ If so, what proportion of fragility fracture patients were assessed in accordance with national guidance?
    - ❏ If not, is local data available from the 2007 RCP-CEEU national clinical audit of falls and bone health for older people?

4. What is the scope of current FLS activities:
    - ❏ Does the FLS serve in-patients only, out-patients only or both?
    - ❏ Approximately how many fragility fracture patients are assessed by the FLS annually?
    - ❏ What proportion of fracture patients aged over 50 years are assessed by the FLS?
    - ❏ Does the FLS receive referrals from the radiology department for patients with suspected vertebral fractures?

5. Is a Trust-wide FLS protocol in place?
    - ❏ If so, was this protocol developed in collaboration with local primary care organisations?
    - ❏ Has the FLS been subject to local audit?
        - If so, what proportion of fragility fracture patients received post-fracture assessment according to national guidance?
        - If so, what proportion of fragility fracture patients were recommended initiation of treatment according to national guidance?
    - ❏ Does the FLS have capacity to conduct follow-up of fragility fracture patient management?
        - If so, does the FLS protocol specify the frequency for follow-up?
        - If so, what proportion of fragility fracture patients persist with management according to national guidance at 6 months, 1 year and/or 3 years?
    - ❏ Does the NHS Trust have a separate general osteoporosis assessment and management protocol in place?

6. Have any abstracts or publications been produced by the FLS team?

Appendix 3

Generic Fracture Liaison Service business plan template

Executive Summary

- A Fracture Liaison Service delivers intervention to up to 50% of future hip fracture patients with potential to halve the number of future hip fractures that occur secondary to prior fragility fractures
- A Fracture Liaison Service (FLS) provides a proven healthcare delivery mechanism to ensure that Patients presenting to [St. Anywhere's Hospital] with fragility fractures are assessed and treated in accordance with local and national guidelines
- FLS targets assessment and treatment to the most readily identifiable group of patients at high risk of fracture, particularly at the hip, because the majority of patients with fragility fractures present to Accident & Emergency departments
- Half of all hip fracture patients have suffered prior clinically apparent fragility fractures that could and should have triggered secondary preventative care[3]
- The Department of Health[9], the National Osteoporosis Society[32] and all relevant national professional associations[3] advocate the need for universal adoption of the FLS model across the NHS
- In [20XX/20YY] there were [CC] admissions for hip fractures in women at [St. Anywhere's Hospital] costing an estimated [£XXX,YYY]
- The recurrent cost of the proposed service ([£XXX,YYY]/year) is less than/comparable to the cost of [Z] hip fractures to the local NHS and Social Service budget. If the service prevents [AB%] of fractures overall, this would save [£CCC,DDD] in terms of averted fractures
- The increased clinical activity associated with the proposed service is estimated to generate [£EEE,FFF] income for the Trust per year; giving a surplus of [£GG,HHH] after taking into account recurrent costs
- FLS has been endorsed by the Department of Health[9,31], the Royal College of Physicians[25] and the joint British Orthopaedic Association – British Geriatrics Society guidance on care of patients with fragility fractures[3]

The economic burden of hip fracture: key facts

- Hip fracture is the most common cause of acute orthopaedic admission for older people[127]
- During 2007/8, in excess of 77,000 hip fractures occurred in the UK[57] which translates to 300-400 presentations per year to an acute hospital serving a population of 300,000
- Hip fracture incidence has been projected to increase by 50% by 2020[3]

- The current hospital cost of treating hip fractures has been estimated at £12,000 per case[58]; three-quarters of this expenditure is attributable to the hospital stay

- The average District General Hospital spends £3.6 - £4.8 million per year on the management of hip fractures

- Up to 20% of patients admitted from home will be moved into residential or nursing care homes as a result of the hip fracture[128]

- The mean cost of medical and social aftercare was estimated in 2001 to be £13,000 for the first year and £7,000 for the subsequent year after fracture[129]

UK National policy on osteoporosis and falls prevention

England

- National Service Framework for Older People. Section 6 - Falls. March 2001[6]
- NICE Clinical Guideline 21: Clinical practice guideline for the assessment and prevention of falls in older people. November 2004[7]
- NICE Technology Appraisal 161: Review of treatments for the secondary prevention of osteoporotic fragility fractures in post-menopausal women. October 2008[8]
- DH Prevention Package for Older People. Falls and fractures. July-2009[9]

Scotland

- NHS Scotland: Adding life to years: Report of the expert group on healthcare of older people. January 2002[45]
- SIGN71: Management of osteoporosis. June 2003[46]

Wales

- The National Service Framework for Older People. Falls and fractures standard. March 2006[47]

Northern Ireland

- Clinical Resource Efficiency Support Team (CREST): Guidance on the Prevention and Treatment of Osteoporosis. March 2001[49]
- Northern Health and Social Services Board: Ringing the changes - A strategy for older people. December 2002[50]

UK-wide professional guidance on osteoporosis and falls prevention

- Royal College of Physicians: Clinical guidelines for the prevention and treatment of osteoporosis. 1999[51]
- British Orthopaedic Association and British Geriatrics Society 2nd edition of the Blue Book on care of patients with fragility fracture. 2007[3]
- National Osteoporosis Guideline Group (NOGG): Osteoporosis: Clinical guideline for prevention and treatment. 2008[52]
- National Osteoporosis Society Manifestos 2009[32]

The case to establish a Fracture Liaison Service at [St. Anywhere's NHS Trust]

The need for a systematic approach to secondary fracture prevention

Osteoporosis care of fracture patients has been characterised as a Bermuda Triangle comprised of orthopaedic surgeons, primary care physicians and osteoporosis experts into which the fracture patient disappears.[70] This phenomenon presents a similar challenge to management of all chronic conditions whereby end-organ damage is precipitated by worsening of an asymptomatic risk factor. In this regard, strategies for secondary prevention of fragility fractures, strokes and myocardial infarctions - as consequences of diminished bone density, uncontrolled hypertension and hyper-cholesterolaemia respectively- require analogous and comparably reliable healthcare delivery solutions.

Almost thirty years ago, investigators from the United States demonstrated that over half of patients presenting with hip fractures had suffered a prior fragility fracture.[15] Recently published studies from Scotland[17], Australia[16] and the USA[18] have consistently confirmed this earlier finding. Robust evidence demonstrates that treatment of osteoporosis from the time of the first fracture in these patients could have prevented around half of the subsequent hip fractures.[69] Accordingly, targeting all older patients who present with fragility fractures at any skeletal site for anti-fracture therapy provides a means to intervene in up to a half of all future hip fracture cases.

In January 2005, NICE published Technology Appraisal (TA) 87 which advocated osteoporosis assessment and treatment, where appropriate, for all female patients over 50 years of age that have suffered fragility fractures.[29] Accordingly, implementation of NICE TA87 would have enabled the NHS to intervene in half of all future cases of hip fracture. However, national audits conducted in both primary and secondary care during 2007 found that implementation of TA87 was highly variable and generally woefully sub-optimal.[21, 25]

[Consider inserting local data contributed to the 2007 RCP-CEEU national clinical audit of falls and bone health or other local audits of secondary fracture prevention.]

Publication of the update to TA87 guidance, NICE TA161, in October 2008 provides a reinvigorated mandate to the NHS to develop systematic approaches to secondary fracture prevention.[8]

Fracture Liaison Services close the secondary prevention management gap

The structure of the Fracture Liaison Service (FLS) developed a decade ago in Glasgow, Scotland has informed this funding application.[72, 91] The Glasgow FLS has provided secondary preventative assessment and management to >30,000 consecutive fragility fracture patient presentations to hospitals in Glasgow during the period 1999 – 2009. Fracture Liaison Services akin to the Glasgow model had been developed in 29% of NHS Hospital Trusts prior to 2009.[28] Several FLS teams in England have published on the set-up and/or initial audit outputs from their respective services including Ipswich[95, 96], Peterborough[97], Darent Valley[98], Lewisham[76], Cannock[99] and Leeds [100]. Furthermore, FLS has been developed in Northern Ireland and Wales in Belfast[101] and Aberystwyth[102] respectively.

The aims, objectives and service design of the proposed FLS are presented below in the context of existing osteoporosis services at [St. Anywhere's NHS Trust]. A breakdown of anticipated operational costs is provided.

Aim

The aim of the proposed Fracture Liaison Service (FLS) is to provide a comprehensive, efficient and cost-effective service, which provides equal access to facilitate the early diagnosis and management of osteoporosis for patients presenting with fragility fractures to [St. Anywhere's NHS Trust] in accordance with local and national policy.

Objective

The objective of the FLS is to identify and treat patients with osteoporosis, that have suffered a fragility fracture, with a view to reducing the incidence of recurrent osteoporotic fragility fractures and the associated morbidity and mortality.

Insert summary history of osteoporosis service provision for St. Anywhere's.

- How/when service started
- Number of clinics per week
- Clinic staffing
- Patient characteristics
- DXA service

e.g in [20XX/20YY], a bone densitometry service commenced in the Whichever Department using a dual-energy x-ray absorptiometry (DXA) scanner. Referral guidelines have been approved and distributed to local primary care providers and are in accordance with NICE/SIGN guidance. The service is fully funded, and is/is not working to a maximum capacity ([XXXX] scans per year) and has a current waiting time of X weeks.

Current Health Profile – [St. Anywhere's NHS Trust]

Insert summary of health profile of population served by hospital

e.g. The hospital serves a population of [XXX,XXX] and interacts with [XXX] local primary care organisations/practice-based commissioning groups/GPs.

There are [X,XXX] beds at the[X] hospital sites.

Hip fracture incidence for [St. Anywhere's] derived from Hospital Episode Statistics and/or local audit from the National Hip Fracture Database for [200X/Y] using ICD codes for fractured neck of femur, pertrochanteric fracture and subtrochanteric fracture (ICD S72.0, S72.1, S72.2) was [XX,XXX]. [YY.Y%] of these patients ([ZZ,ZZZ]) were >65 years, with [QQ%] being women ([RR,RRR] aged over 65 years).

In [200X/Y] there were a total of [F] fractures in patients aged over 50 years including [A] wrist fractures, [B] humerus fractures, [C] vertebral fractures, [D] hip fractures.

Based on the most recent available cost data, the cost of these fractures is [£FFF,FFF] and the total cost (including social care and long-stay hospital costs, follow-up costs and drug costs) to the Department of Health/[St. Anywhere's Hospital]/ Local PCTs is [£GGG,GGG]. The actual cost of therapies for the prevention and treatment of osteoporosis in the region is uncertain as there are other indications for bisphosphonates (Paget's disease, hypercalcaemia of malignancy) and hormone replacement therapy (HRT) (relief of menopausal symptoms) other than their use for osteoporosis.

In the locality, the expenditure on osteoporosis-related drugs during the last 6 months ([date to date]) was [£H,HHH] for bisphosphonates, [£I,III] for strontium ranelate and raloxifene and [£J,JJJ] for calcium and vitamin D (total costs [£KKK,KKK]).

Service design

The FLS will be implemented in accordance with established UK models.[72, 91] The service will be delivered by a dedicated nurse specialist whose responsibilities would include:

- Liaison with [XXXXX] Department(s) to ensure that all patients aged over 50 years presenting to [St. Anywhere's Hospital] with fragility fractures are referred for assessment of bone density
- Liaison with the Geriatric Department to develop falls prevention clinics for those patients with a history of falls
- Liaison with the Orthopaedic Department to assist in a co-ordinated discharge policy and falls risk assessment for in-patients and also the referral of selected out-patients to appropriate care services
- Establish mutually agreed communication mechanisms with local primary care physicians
- An education and awareness role for patients regarding osteoporosis and falls prevention

[Attach Fracture Liaison Nurse job description and the step-by-step plan for service development.]

Budgetary Impact of FLS on Healthcare Locality

In [20XX/20YY] there were [CC] admissions for hip fractures in patients aged over 50 years at [St. Anywhere's Hospital] costing an estimated [£XXX,YYY]. The recurrent cost of the proposed service ([£XXX,YYY]/year) is less than/comparable to the cost of [Z] hip fractures to the local NHS and Social Service budget. If the service prevents [AB%] of fractures overall, this would save [£CCC,DDD] in terms of averted fractures.

[If in England, consider attaching Department of Health 2009 Prevention Package for Older People impact assessment of fracture prevention interventions[9].]

Projected Costs/Income

Capital Expenditure	
As required (including VAT)	£XX,XXX
Recurrent Expenditure	
1 Full Time Equivalent Band [X] Fracture Liaison Nurse	£XX,XXX
Clerical support as required	£X,XXX
Acquisition of database and support package	£XXX
Production and postage of reports and questionnaires	£X,XXX
Support literature	£XXX
DXA equipment service contract	£X,XXX
DXA equipment depreciation/replacement costs	£X,XXX
Room charges	£XXX
Total Recurrent Costs	**£XX,XXX**
Revenue	
Additional DXA scans	£XX,XXX
Additional outpatient appointments	£XX,XXX
Additional procedures e.g IV therapy	£XX,XXX
Total Additional Revenue	**£XX,XXX**
Revenue surplus generated service (Revenue – Costs)	**£XX,XXX**

Summary

Hip fractures exert an enormous financial burden on NHS budgets in primary and secondary care. Half of hip fracture patients have suffered a prior fragility fracture that should have served as a trigger for secondary fracture prevention. Fracture Liaison Services provide a proven mechanism to ensure that patients presenting with fragility fractures receive secondary preventative care to reduce their risk of subsequent hip fracture. FLS have been successfully implemented within a quarter of NHS Hospital Trusts across the UK resulting in healthcare inequality in the care of fracture patients.

FLS implements NICE TA161 and [the NSF for Older People Section 6 in England]; [the NSF for Older People (falls and fractures section) in Wales]; [SIGN71 in Scotland]. FLS has been endorsed by the Department of Health and the Royal College of Physicians as an example of best practice to deliver secondary fracture prevention. Professional consensus guidance in the 2007 BOA-BGS Blue Book on care of patients with fragility fracture advocates establishment of an FLS in every UK hospital as a national healthcare priority.

Appendix 4

Step-by-step guide to Fracture Liaison Service development

Critical success factors

The success factors common to the establishment and operation of effective Fracture Liaison Services are provided in the check list below:

- ❑ Establishment of a multi-disciplinary strategy group from project outset
- ❑ Adequate local access to axial bone densitometry
- ❑ Appointment of a Fracture Liaison Nurse Specialist
- ❑ Protected time for input from the Lead Clinician in Osteoporosis
- ❑ Assessment/management protocols agreed with all stakeholders
- ❑ FLS database to underpin communication and audit
- ❑ Specifics of communication mechanism agreed with primary care
- ❑ Established referral mechanism from FLS to local Falls Prevention Team
- ❑ Systems in place to monitor adherence to management recommendations issued by FLS

Preparatory work prior to FLS becoming operational

Establish multi-disciplinary stakeholder group likely to include:

- ❑ NHS Hospital Trust "Lead Clinician in Osteoporosis" (Rheumatologist, Endocrinologist, Geriatrician or Orthopaedic Surgeon)
- ❑ Consultant Orthopaedic Surgeon with an interest hip/fragility fracture surgery
- ❑ Consultant Geriatrician or Ortho-geriatrician
- ❑ National Hip Fracture Database Lead Clinician (if the Trust is registered)
- ❑ Relevant specialist nurses, physiotherapists and other Allied Health Professionals
- ❑ Personnel responsible for development/installation of FLS database
- ❑ Representatives from hospital and primary care medicines management
- ❑ Representative from local PCT and/or practice-based commissioning groups
- ❑ Representative from local General Practice
- ❑ Representative from local Public Health

Utilise Plan-Do-Study-Act (PDSA) methodology to plan initial FLS development and cycle of continuous improvement:

Plan

- ❏ Conduct baseline audit to establish care gap
- ❏ Design prototype service to close the management gap
- ❏ Write aims and objectives
- ❏ Identify how you will capture fracture patients
- ❏ Write protocols for wards and fracture clinics for patient identification, investigation and treatment
- ❏ Ensure algorithms and protocols are agreed before nurse-led clinics are in place
- ❏ Agree all documentation and communication mechanisms
- ❏ Engage healthcare commissioners to fund pilot phase

Do

- ❏ Implement prototype service model
- ❏ Collect audit data throughout pilot phase

Study

- ❏ Analyse improvement in provision of care from audit
- ❏ Refine prototype service model to improve performance

Act

- ❏ Implement changes and monitor performance improvement
- ❏ Repeat PDSA cycle through continuous ongoing audit and review

Issues to consider when FLS is operational

- ❏ Optimising patient identification
  - Attend wards to see patients admitted with fragility fracture
  - Attend Trauma team meetings to discuss patients admitted to wards overnight
  - Attend designated new fracture clinics if operated
- ❏ Ongoing evaluation of optimal terms to communicate the role of fracture risk assessment and falls assessment to patients
- ❏ Evaluate effectiveness of delivery of information regarding lifestyle advice and modifications
- ❏ Discuss with FLS team whether further treatment is needed as per protocol, discuss with patient and include in letters
- ❏ Discuss with ward staff and orthopaedic surgeons management plans, and discuss and inform input with the multidisciplinary team
- ❏ Decide on appropriate referral if needed as per local FLS protocol
  - Metabolic bone clinic
  - Bone densitometry
  - Falls service
- ❏ Ongoing evaluation of response to letters sent to colleagues:
  - GPs
    - Assessment done
    - Fracture type
    - Risk factors
    - Investigation results
    - Suitable treatment
    - Follow-up assessment (at 3/6/12 months)
  - Metabolic Bone Clinic
  - Falls service
  - Orthopaedic surgeons
- ❏ Consider pro-active FLS-led 6 month review of all patients via GP questionnaire and patient questionnaire if appropriate

Appendix 5

Generic Fracture Liaison Nurse Specialist job description

Job title:	**Fracture Liaison Specialist Nurse**
Location:	**[As appropriate]**
Responsible to:Managerially:	**[To be completed locally]**
Professionally:	**[To be completed locally]**
Grade:	**[To be completed locally]**

Job Summary

1. To co-ordinate and be responsible for the development of the Fracture Liaison Service for [*location*].
2. To be aware of the Osteoporosis Guidelines for [*location*] involved in the Osteoporosis initiative.
3. To develop links and communication between the orthopaedic services and [metabolic bone unit/ Rheumatology/ Elderly Care].
4. To develop appropriate referrals and pathways of care for patients admitted with fragility fractures that may have osteoporosis.
5. To be autonomous and be prepared to make decisions where appropriate, manage own time and workload and work individually as well as contributing to the team when necessary.
6. To assist in the establishment of a multidisciplinary unit for the diagnosis and management of bone disorders principally osteoporosis.
7. To act as a link person enhancing co-ordination and communication between the various members of the orthopaedic and medical teams, to the metabolic bone team as well as other areas that refer patients to the unit.
8. To help establish educational and health promotion programs for patients attending the unit and those seen at other sites.
9. To perform audit of the unit, the developing service and associated bone densitometry screening programs.
10. To be aware of time constraints and financial implications of developing the service projects.
11. To be responsible for accurate data entry and of data associated with research and be proficient in appropriate computer packages.
12. To identify any areas of opportunity within the unit for development of research, and assist in their evolution. To be involved in the submission of ethics proposals, grant applications and the setting up of research and audit.

Core Responsibilities

1. To ensure an efficient and effective service is given to patients who may have osteoporosis who are admitted with fragility fracture.
2. To liaise with all members of the team to ensure smooth running of the referral service and unit.
3. To develop and maintain accurate data collection and storage using computer skills.
4. To be skilled in patient assessment techniques such as taking histories and clinical skills including venepuncture for patients needing investigations.
5. To be a source of knowledge and provide educational support concerning osteoporosis and identification of research areas.
6. To be involved in the development of proposals, ethical requirements and implementation of research within the unit.
7. To maintain and update own knowledge and clinical skills of bone disorders to enable education and advice to be given to patients and their families.
8. To maintain and develop own personal and professional development according to UKCC guidelines.
9. To liaise with all members of the team to ensure smooth running of the unit.

This job description should be regarded only as a guide to the duties required and is not intended to be definitive.

8. References

PubMed ID numbers are provided for each reference where available. The PubMed ID number can be entered as a search term into the PubMed database at http://www.ncbi.nlm.nih.gov/pubmed/. This will direct the reader to the abstract of the paper and usually provides a link to e-publication websites. For references without PubMed ID numbers, links to websites where the document can be downloaded are provided where available.

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9. Acknowledgements

The content of this FLS Resource Pack has been informed by the work and commitment of numerous healthcare professionals from the United Kingdom and many other countries throughout the world. The authors would like to express their gratitude to all concerned. Particular thanks go to the individuals listed below whom have provided invaluable advice and input during the drafting of the document:

- ❏ Professor David Marsh, Professor of Clinical Orthopaedics, University College London
- ❏ Dr. Alastair McLellan, Consultant Physician, Western Infirmary, Glasgow
- ❏ Dr. Stephen Gallacher, Consultant Physician, Southern General Hospital, Glasgow
- ❏ Professor Roger Francis, Professor of Geriatric Medicine, University of Newcastle upon Tyne
- ❏ Professor Opinder Sahota, Professor of Gerontology, Queen's Medical Centre, Nottingham
- ❏ Dr. Gavin Clunie, Consultant Rheumatologist, The Ipswich Hospital
- ❏ Dr. Jonathan Bayly, Visiting Fellow, University of Derby
- ❏ Dr. Eamonn Brankin, Honorary Clinical Senior Lecturer, University of Glasgow
- ❏ Dr. Alun Cooper, Senior Partner, Bridge Medical Centre, Crawley

We would also like to thank Helen Bailey and Jacqueline Crowe for their patience and dedication through the numerous reviews of the document.

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Femi Adekunle

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Provided as a Service to Medicine by Novartis January 2010 SDT09000002

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