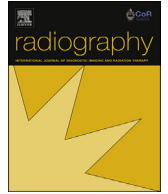




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Review article

An evaluation of Fracture Liaison Services in the detection and management of osteoporotic fragility fractures: A narrative review

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ABSTRACT

Objectives: To evaluate the current evidence for whether Fracture Liaison Services are being utilised effectively in the UK to aid in the prevention of fragility fractures.

Key findings: Radiological under-reporting and non-standardised assessment of fragility fractures still persist, with low numbers of patients undergoing a risk assessment and treatment for secondary prevention of fracture. In order to improve care for these patients, the reporting of vertebral fractures must be improved and standardised in order to identify patients at increased risk of secondary fragility fractures. Fracture Liaison Services determine the need for anti-resorptive therapy for the prevention of future fragility fractures. Targeted treatment of at-risk patient groups has been shown to reduce the risk of further fracture.

Conclusion: Fracture Liaison Services have been shown to be cost effective, while reducing the risk of secondary fractures, but they are not currently offered by all NHS providers.

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Introduction

Osteoporosis is a bone disease characterised by a loss of bone density and deterioration in bone structure. For patients with osteoporosis, the resilience of the bone is compromised, placing the patient at an increased risk of a fragility fracture. Osteoporosis is often referred to as a 'silent disease', where the patient is often asymptomatic until a fracture occurs. Fragility fractures are defined as those which occur from low-impact mechanical forces that would not normally result in fracture; these are due to low bone density and structural deterioration of bone tissue. The World Health Organisation (WHO) has quantified these forces as being equivalent to those experienced from a fall from standing height or less.¹

This type of injury can have a very poor prognosis, with fragility fractures of the hip and spine associated with increased 5-year mortality rate. A recent study has revealed that 24% of women and 20% of men re-fractured, and 26% of women and 37% of men

died without re-fracture in this 5-year period. Of those who re-fractured, a further 50% of women and 75% of men died, resulting in a total 5-year mortality rate of 39% in women and 51% in men.² An added complication is that approximately 50% of people with a fragility fracture will suffer another. Warning signs do exist for this patient group, as almost half of those that present with a hip fracture will have suffered a previous fragility fracture,³ thus highlighting the missed opportunities to identify and treat this population.

This paper presents a synthesis of the current evidence base for the detection and management of osteoporotic fragility fractures, including Fracture Liaison Service initiatives. A systematic approach was undertaken to identify relevant sources, charting the key findings to generate an integrative narrative review and highlighting implications for future commissioning and service delivery.

An ageing population, a cost to society

Large increases in life expectancy are being observed in the majority of developed countries. As a consequence, the number of fractures in the elderly population is expected to increase.⁴ In Australia it is expected that 66% of those aged over 50 will be

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affected by osteoporosis.⁵ This is similar to the UK, where osteoporosis and the associated consequences are becoming ever more prevalent, with 1 in 2 women and 1 in 5 men expected to have a fragility fracture after the age of 50.¹ The synergy of population ageing and osteoporosis will become an economic burden.^{6,7} The human cost is more difficult to measure, but the co-morbidities and potential mortality rate associated with an ageing population are not difficult to appreciate. With this in mind, it is crucial that secondary prevention becomes a core characteristic in the management of fractures and osteoporosis.⁸

Cost is always at the forefront of discussion of service delivery and provision in the UK National Health Service (NHS), and this is no different in the care of osteoporosis and fragility fractures. Osteoporotic fragility fractures are costly both in human and economic terms. Over 300,000 patients present with fragility fractures to hospitals in the UK each year. Social and medical costs from fragility fractures to the UK healthcare economy were estimated at £1.8 billion in 2000, with much of this due to fractures of the hip.⁸ Due to an ageing population this has the potential to increase to £2.2 billion by 2025, with most of these costs relating to the ongoing care of fragility fractures to the hip, spine, and wrist.⁹ Hip fractures are the most significant type of fragility fracture because of the human impact and the need for long-term institutional care, and associated high medical costs.¹⁰ The expected level of cost is not unique to the UK, where the cost of osteoporosis and fracture care in Australia is expected to rise to 3.84 billion Australian Dollars (£2.2 billion) by 2020.⁵ Nakayama et al.⁷ paint a similarly bleak worldwide picture in terms of a projected cost of 37 billion Euros in Europe by 2025 and 12.5 billion US Dollars in China by 2020. Despite these large costs, the rate of investigation and treatment of osteoporosis remains low. However, a recent technology appraisal of bisphosphonate treatment for osteoporosis by the National Institute for Health and Care Excellence (NICE)¹¹ aimed to establish at what level of absolute fracture risk the treatments are cost effective. A reduction in price means that bisphosphonates are now cost effective even in patients with a low level absolute risk (i.e. oral medication should be considered for those with >1% risk of fracture in a 10-year period). The treatment regime should be based on individuals (rather than populations) in order to understand relative advantages and disadvantages. For those patients considered higher risk (>10% risk of fracture in a 10-year period), or those who cannot tolerate oral medications, it is appropriate to offer intravenous bisphosphonates. The purpose of this technology appraisal [TA464] was to determine the cost effectiveness of bisphosphonates in reducing fracture risk. Clinical need should dictate treatment but the outcome of this technology appraisal may encourage the use of bisphosphonates in patients who are considered at risk of fragility fracture.

Fragility fracture identification: the role of radiology

Positive identification of fragility fractures is critical to the care of patients with osteoporosis. Vertebral fractures are the most common type of fragility fracture, accounting for almost half of all fractures due to osteoporosis.^{12,13} They are a significant health concern due to the increased risk of future fractures and an associated increase in morbidity and mortality.^{14,15} In this patient group, a previous fracture is thought to double the risk for subsequent fractures, and in the case of vertebral fractures this risk is quadrupled.⁴ The risk of vertebral fracture increases exponentially with a greater number of prior vertebral fractures; known as the *vertebral fracture cascade*. As a further complication the risk of hip fracture is also doubled.^{13,16}

Despite the clinical significance of vertebral fractures, these are often overlooked clinically and/or radiologically, with many studies

demonstrating that the under-reporting of vertebral fractures is a world-wide problem.^{14,16–18} In Europe, around 1/3rd of vertebral fractures are overlooked and this has been attributed to asymptomatic presentation, lack of radiographic detection and ambiguous terminology in the radiological report (i.e. wedging, vertebral height loss, deformity, or end-plate infraction or depression).^{13,14} Even when they are detected in hospital, it does not necessarily mean that it will lead on to an assessment of bone health or subsequent treatment.¹⁵

In the clinical setting the asymptomatic nature of vertebral fractures presents a challenge, meaning that they can go untreated and the future fracture risk remains. So how can radiology help?

The National Osteoporosis Society (NOS) has provided recent guidance¹⁹ about the detection of vertebral fractures, where it explains the critical role of diagnostic imaging services. Radiology practitioners are often best placed to initiate the most substantial improvements in the vertebral fracture pathway – starting with effective detection of fractures. The NOS has recommended that local protocols are established to ensure that the spine is routinely evaluated for the presence of vertebral fractures of the thoracic and lumbar spine on any imaging, regardless of the clinical question. Upon identification of a fracture the referring clinician should be alerted, using a fail-safe mechanism, so that they understand need to investigate the patient for fracture risk. It is crucial that unambiguous terminology is used and the NOS has recommended that the condition of the vertebral body should be clearly described in one of three ways: (i) vertebral fracture (including level, severity and timing), (ii) non-fracture vertebral deformity (i.e. Scheuermann's disease or Schmorl's nodes), and (iii) normal.¹⁹ The NOS also provide suggested standard phrases that could be used in a radiological report.

In addition to the targeted identification proposed by the National Osteoporosis Society, reporting practitioners should always be aware of the opportunistic chance to identify fragility fractures. Incidental diagnosis of fragility fractures can often be made on computed tomography (CT) scans of the thorax and abdomen. Multi-Detector CT (MCDT) midline sagittal images can routinely be reformatted (without additional radiation dose to the patient) to help identify fragility fractures. Sagittal reformats are particularly sensitive for identification of vertebral fractures due to good visualisation of the middle of the end plate, where insufficiency fractures typically occur.^{16,20}

Although the clinical significance of vertebral fractures is understood and the importance of opportunistically identifying such fractures has been recognised, there is still significant under-reporting. Widespread underreporting occurs in all imaging techniques, with MDCT missing more opportunities than radiographic imaging.¹⁶ Standardisation of the radiological assessment of vertebral fractures is also required, where clinicians often fail to recognise or report mild to moderate vertebral fractures, or use terminology that is not specific for fracture.²⁰ Effective communication to the wider team caring for these patients is critical to ensure that eligible patients receive either dual-energy X-ray absorptiometry (DXA) or pharmacologic therapy to reduce future fracture risk.^{20,21} Correct identification of fragility fractures that leads onto suitable investigation is the key improvement required for secondary prevention.¹⁵

Fracture Liaison Services: a long-term solution, not a quick fix

To reduce the risk of re-fracture a co-ordinated approach is needed to identify patients most at risk. A Fracture Liaison Service (FLS) is a proven approach to delivering comprehensive secondary prevention, which requires a multidisciplinary approach to be an effective service. This should comprise osteoporosis assessment

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