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Better bone health for everybody

Guidance for the management of symptomatic vertebral fragility fractures

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Acknowledgements

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Project Support Officer, Royal Osteoporosis Society.

Funding: This document was produced by the Royal Osteoporosis Society with support in the form of financial grants from Amgen and Stryker who had no editorial input or influence in the development, authorship or distribution of the content.

Publication date: May 2022

Date for review: May 2025

Endorsements



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Foreword

A vertebral fracture significantly increases a person's risk of another vertebral fracture or a hip fracture. This has potentially long-term impact on a person's quality of life, for instance through chronic pain, not to mention significant cost to the NHS. Identifying vertebral fractures, effectively managing their symptoms and providing appropriate support is therefore vital.

Currently only around 30% of vertebral fractures are identified. A wide range of health care professionals will see people who may have a vertebral fracture, giving many opportunities to improve identification of vertebral fractures and to manage their symptoms effectively. It is important that all those who have contact, directly or indirectly with people with osteoporosis are familiar with the signs of a vertebral fracture, can refer appropriately, and know the best treatment approaches to manage the often debilitating symptoms patients experience.

Like most musculoskeletal conditions, excellent support for people with vertebral fractures does not sit with one part of the NHS, or indeed entirely within the NHS. People need a range of support to manage their pain and other symptoms, take part in appropriate exercise, maintain their mental health, and enable them to continue to live a full and active life. Clinicians in primary and secondary care, a range of AHPs, nurses, pharmacists, radiologists, non-clinical roles such as social prescribing link workers, as well as voluntary organisations such as ROS, all have a role to play. All these people contribute to an integrated and person-centred approach to providing appropriate management and support, which will enable those with a vertebral fracture to live healthy and active lives.

This guidance will make a big contribution to enabling the wide range of professionals involved to contribute to delivery of the right support and symptom management for each person.

Sue Brown

Chief executive – the Arthritis and Musculoskeletal Alliance (ARMA)

“I was diagnosed with osteoporosis when I was in my fifties and told I had the bones of an eighty-year-old and had already lost some height. Several years ago, I leant back too hard against a hard surface and suffered a sharp pain and an x-ray showed I had fractured two or three vertebrae in my lower back.

These were seriously uncomfortable for a long while and none of the pain was controlled by the recommended standard analgesia of paracetamol and ibuprofen. I tried everything open to me – a tens machine seemed useless, and tramadol while helpful with the pain caused very unpleasant withdrawal symptoms and I vowed never to take it again.

When my fractures were at their most painful, I felt depressed and hopeless because there seemed to be no improvement as the months went by. I feared that this was my future – depressing, seemingly never-ending pain, and an inability to do the things I loved, like play my cello.

I am now six inches shorter, and my tummy sticks out, I can no longer eat as much as I would like without discomfort. I need to sit on a child booster seat just to have my hair cut. I cannot sit on hard surfaces and some of my kitchen shelves are out of reach. I cannot sit or stand for a too long without discomfort and struggle to change my shoes or cut my toenails as bending over is too uncomfortable.

This guidance is so important. If it had been available when I had my fractures, I would have had a much better experience. My pain could have been better controlled and I would have been reassured that the pain would almost certainly go. This one thing would have been a great help to my mental state and made the difference between feeling hopeless to being hopeful.”



Philippa Russell

ROS patient advocate

Key Practice Points

Identification	<p>Where there are concerns about the occurrence of a vertebral fracture(s), recent imaging that includes the spine should be reviewed. If there is none or the symptoms began after the previous imaging, patients should be referred for spine imaging. The referral should highlight the concern about the presence of fracture.</p>
Assessment	<p>All patients with vertebral fracture should have an assessment to determine the impact of the fracture (s) on pain, function and quality of life (see figure 2).</p> <p>Patients with symptomatic vertebral fracture (and their family members or carers as appropriate) should be involved in shared decisions about their care.</p>
Pain	<p>The risks and benefits of pharmacological and non-pharmacological therapies should be explained to patients, taking into account their individual circumstances and underlying comorbidities.</p> <p>Consider offering paracetamol for pain; regular dosing may be required. Paracetamol should be considered ahead of oral NSAIDs, cyclo-oxygenase 2 (COX-2) inhibitors or opioids.</p> <p>If paracetamol is insufficient for pain relief then the addition of opioid analgesics and NSAIDs should be considered. The risks and benefits of such therapy should be considered, particularly in older people and those with significant comorbidities.</p> <p>For persistent severe pain consider use of centrally acting therapies including tricyclic anti-depressants, and gabapentin after discussion about the potential risks and benefits. If pain persists and remains a management problem consider referral to multidisciplinary pain management team.</p> <p>For hospitalised patients where pain is unremitting after 48 hours and severely compromising activities of daily living and mobility in spite of initiation of therapy and acute pain management, and where there is evidence of vertebral body oedema on MRI imaging consider referral for vertebral augmentation.</p>

<p>Exercise</p>	<p>All patients should be given advice about exercise and physical activities of daily life and leisure. This should be provided promptly without waiting for referral to specialist services.</p> <p>All patients should be considered for an individualised exercise programme 4-12 weeks after vertebral fracture, as tolerated, or when acute fracture-related pain has diminished, or after 12 weeks (when most fractures will have healed), based on patient preference and clinician judgement. The exercise programme should focus on goals such as improving back extensor endurance, balance and physical functioning.</p> <p>After the fracture has healed, all patients should initiate a progressive balance and strength training programme.</p>
<p>Psychological symptoms</p>	<p>Assess for the presence of psychological factors including anxiety, low mood and pain catastrophising which may influence the occurrence and persistence of symptoms. Consider also the presence of pain-related fear, lack of confidence, fear of falling, and concerns about body image. Acknowledge the presence of these symptoms and provide support and therapy.</p> <p>All patients should receive education on pain expectation. It may help the patient to understand how pain can settle and why it may recur.</p>
<p>Falls</p>	<p>Undertake a falls risk assessment and if the patient is at risk consider referral to an appropriate falls prevention service.</p>
<p>Self-Management</p>	<p>All patients should receive advice, tools and support for effective self-management.</p> <p>All patients should receive accurate verbal and written information about osteoporosis and vertebral fracture to enhance their understanding of the condition and how medication, nutrition, fall prevention and exercise are important in its management.</p> <p>For patients with significant activity limitations, for example, difficulty dressing and self-care, consider referral to an occupational therapist.</p>
<p>Secondary Fracture Prevention</p>	<p>All patients with a vertebral fragility fracture should be considered for fracture risk assessment where appropriate to reduce fracture risk and prevent further fractures.</p>

Purpose of this guidance

This guidance was developed after a scoping and consultation process involving patients, relevant professional bodies and expert clinicians in the field. It was informed by published evidence and consensus.⁽¹⁾

The guidance is intended for use by healthcare professionals who engage directly or indirectly with people with osteoporosis and vertebral fragility fractures. This includes: general practitioners, secondary care physicians including rheumatologists, geriatricians, endocrinologists, metabolic bone specialists, orthopaedic and spinal surgeons, emergency care healthcare professionals, radiologists, occupational therapists and physiotherapists, clinical pharmacists, nurses, and other allied health professionals.

The guidance outlines how healthcare professionals can best support patients who present in the community or in hospital with symptoms of a vertebral fracture.

This includes:

- assessment and management of symptoms of patients with a vertebral fracture,
- support for self-management,
- appropriate signposting of patients to other published guidance and resources.

Detailed guidance regarding the identification of vertebral fragility fractures and secondary fracture prevention is outside the scope of this document.^(2,3) These clinical pathways are described in [Appendix B](#). Pathological fractures and traumatic vertebral fractures are outside of the scope of this document.

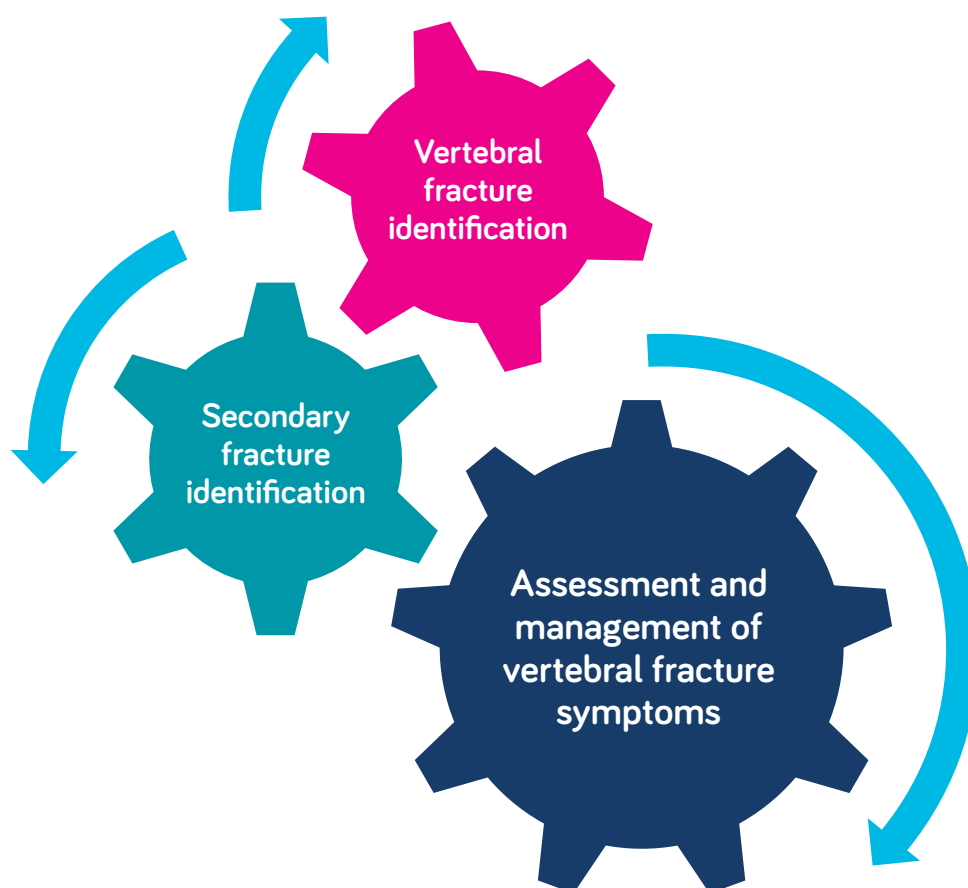
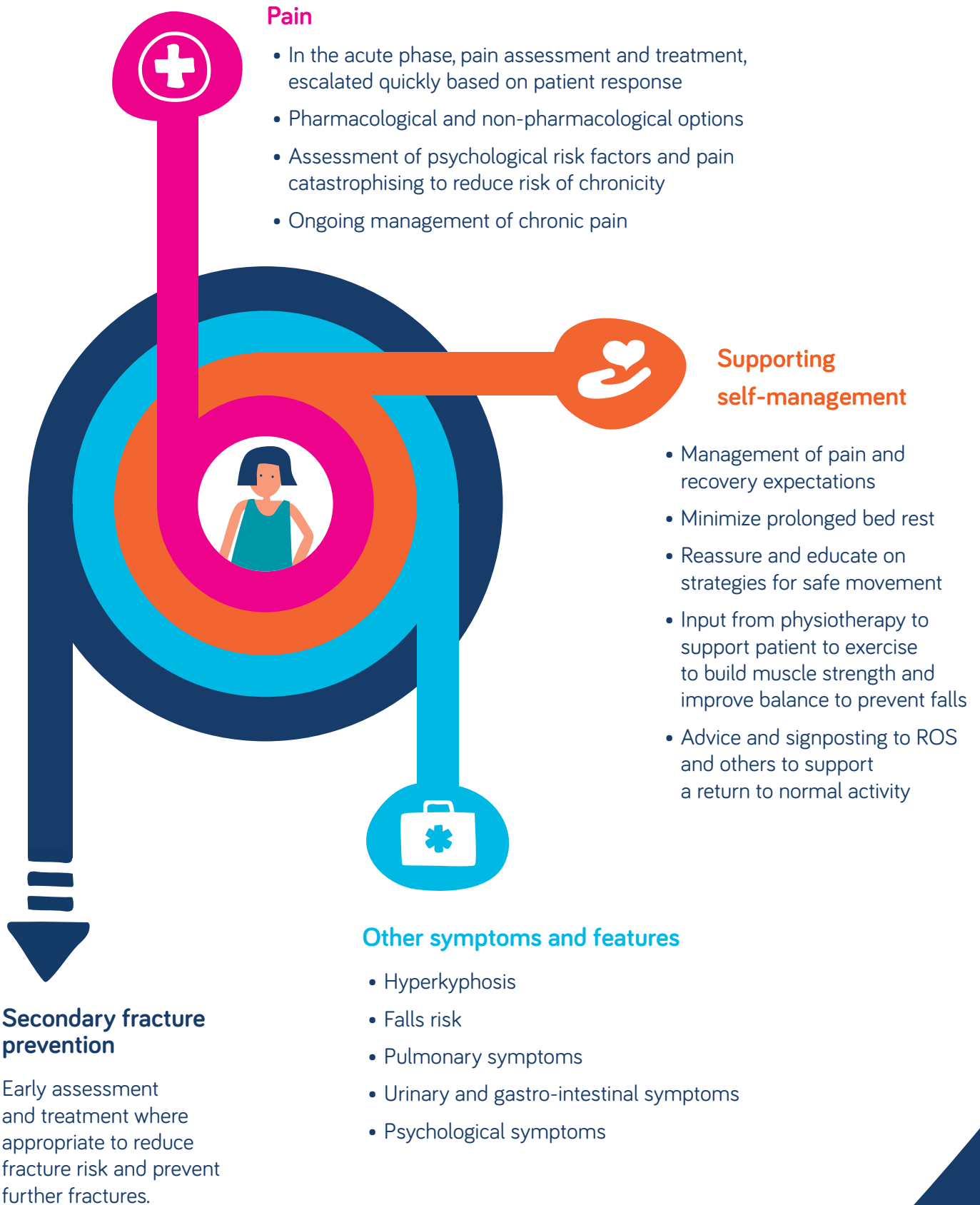


Figure 1. Assessment and Management of Symptomatic Vertebral Fracture



Background

Definition of vertebral fragility fracture

A vertebral fragility fractureⁱ is defined as a significant reduction in vertebral height or vertebral deformity as a consequence of structural failure.

Epidemiology

Vertebral fractures are the most common osteoporotic fracture and constitute a major health problem. They lead to both acute and chronic back pain, substantial spinal deformity, functional disability, decreased quality of life and increased mortality.^(4,5) They may occur with falls or day-to-day activities that involve very little trauma, such as bending forward, twisting, lifting light objects, and even sitting from a standing position onto a low chair.⁽⁶⁾

One in eight men and women over the age of 50 years have evidence of a vertebral fracture.⁽⁵⁾ The incidence of vertebral fracture increases with age from around the age of 50 years and, at all ages, is greater in women than men.^(9,10) While more than one in ten of women over the age of 50 have one or more vertebral fractures, this rises to one in five in the over 70s.^(8,11)

A vertebral fracture is a powerful predictor of future fracture – up to 20% of patients will sustain another fracture in the first year.⁽¹²⁾ One vertebral fracture increases the risk of a new vertebral fracture five-fold, and up to twelve-fold in the presence of two or more vertebral fractures.^(13,14) One vertebral fracture leads to an increased relative risk of 2.8 for hip fracture – and over 55% of older women with hip fracture have evidence of a prior vertebral fracture.^(14,15)

Most vertebral fracture patients are managed in the community. Only a small proportion of vertebral fractures (5-8%) require admission to hospital in the acute phase. These patients tend to be older (mean age 81 years), frail, with

coexisting comorbidities and a significant number have cognitive impairment.⁽¹⁶⁻¹⁹⁾ Increasing age and multiple comorbidities are associated with longer hospital stay and higher mortality. For these patients the adverse effects of analgesia and immobilisation during bed rest often lead to additional medical complications (e.g. chest infections, deep vein thrombosis and pulmonary embolus) as well as muscle wasting and further bone loss.⁽²⁰⁾ One in five in-patients with a vertebral fracture are re-admitted within 30 days.⁽²¹⁾

Economic impact

Vertebral fractures can incur significant care costs. The average cost per clinical vertebral fracture is estimated at approximately £3,400 in the first year.⁽²²⁾ In the year after fracture, vertebral fractures account for 14 additional GP visits,⁽²³⁾ and an average of 20 working days lost.⁽²⁴⁾

The cost of all fragility fractures is forecast to increase significantly by 2034 due to a predicted 13% increase in the population over the age of 50, and an anticipated increase in all fragility fractures of 26%.⁽²⁵⁾



Every vertebral fracture accounts for
14 additional GP visits
in the year after fracture⁽²³⁾

ⁱ Vertebral fragility fractures can be traumatic or as a result of a force equivalent to a fall from standing height or less. This guidance provides advice on the assessment and management of vertebral fragility fractures caused by osteoporosis. For the purposes of this document vertebral fragility fractures caused by osteoporosis will be referred to simply as vertebral fractures.

Personal impact

Back pain is the most frequent symptom of vertebral fracture. In the acute phase there may be radiation of pain. Pain following a fracture is typically severe for a period of weeks to months, gradually improving as the fracture heals. Many patients however, experience persisting pain beyond three months. Acute pain, although not universal, is caused by the fracture. Long term persistent pain may be mechanical and related to shortening and curvature of the spine resulting in muscle spasm, ligament strain and arthritic changes affecting the joints. Patients may experience either or both types of pain.

A proportion of patients, particularly those with multiple vertebral fractures may develop progressive height loss and hyperkyphosis. This may result in difficulty bending, lifting and carrying out everyday activities, a reduction in intra-thoracic volume and abdominal protrusion.

Patients' experiences also include:

- reduced exercise tolerance
- fatigue
- impaired balance and increased risk of falls
- increased pain on sitting upright
- breathlessness
- early satiety
- heart burn and reflux
- urinary frequency
- stress incontinence
- increased risk of chest infections and pressure sores.

Vertebral fractures are also linked to a range of psychological symptoms including low mood, anxiety, loss of self-confidence and depression. Patients often develop a fear of falling and reduce their activity to avoid incurring another fracture. Physical activity avoidance can result in reduced mobility and physical performance. Patients may start to restrict their social activity, leading to social isolation and loneliness in many cases. A recent systematic review and meta-analysis showed reduced physical and mental health-related quality of life in older people with vertebral fractures compared to those without.⁽²⁶⁾

Identification

Identification of vertebral fractures is important because:

1. It provides the patient with an explanation of the cause of the pain and symptoms they are experiencing and their prognosis. It then allows healthcare professionals to support them in managing their symptoms.
2. Previous fracture is a powerful predictor of future fracture and will usually indicate a need for bone protective therapy to prevent further fractures.

Currently only around 30% of vertebral fractures are identified.^(6,27) This is in part because many patients either do not have symptoms or have symptoms that are self-managed and therefore do not come to clinical attention. Those that come to clinical attention are most likely to be associated with back pain that is sufficiently severe at the acute phase, and/or associated with a notable trauma. In many patients however, back pain may not alert health professionals or patients to the presence of a vertebral fracture, and it will remain undiagnosed.

Assessment and management

Identification of vertebral fractures

Vertebral fractures are typically diagnosed radiographically (X-ray, CT or MRI) using recognised and validated methods.⁽³⁾ They can also be diagnosed via vertebral fracture assessment completed at the time of a bone mineral density assessment with dual-energy X-ray absorptiometry (DXA).⁽²⁸⁾

Back pain, the most frequent presenting symptom of vertebral fracture is common. It may be difficult to distinguish those with vertebral fracture from those with back pain due to other causes, including osteoarthritis and disc degeneration. Healthcare professionals should have a high index of suspicion in patients presenting with back pain, particularly older patients and those with existing risk factors for osteoporosis.

There are no clinical signs which are specific for vertebral fracture. In the acute phase though the spine may be tender to deep palpation and percussion and there may be paravertebral muscle spasm.

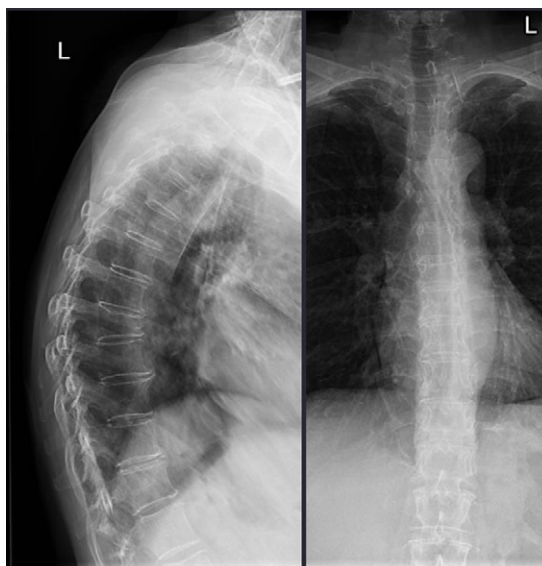
Vertebral fractures are associated with a reduction in vertebral height and with increasing number of fractures height loss and kyphosis may occur. Although these symptoms may be a feature of other spine disease such as disc degeneration their presence should increase suspicion for the presence of vertebral fracture.

Where there are concerns about the occurrence of a vertebral fracture(s), recent imaging that includes the spine should be reviewed. If there is none or the symptoms started following previous imaging, patients should be referred for spine imaging. The referral should highlight the concern about the presence of fracture.

With increasing use in medical practice of CT and MRI imaging, the presence of previously undiagnosed vertebral fractures may be identified opportunistically on imaging undertaken for other reasons. It is important that the occurrence of these fractures is brought to clinical attention and that those affected are referred for assessment including identification and management of any symptoms they may be experiencing. The patient should also receive a bone health assessment and treatment as appropriate to reduce the risk of further fractures.

Where there are concerns about the occurrence of a vertebral fracture(s), recent imaging that includes the spine should be reviewed. If there is none or the symptoms began after the previous imaging, patients should be referred for spine imaging. The referral should highlight the concern about the presence of fracture.

Lumbar spine MRI with fracture at L1



Thoracic spine radiograph with fracture at T7

Assessment and general measures

All patients with vertebral fracture should have a holistic assessment to determine the impact of the fracture(s) on pain, function and quality of life (see figure 2). Details about individual assessments are included in this guidance.

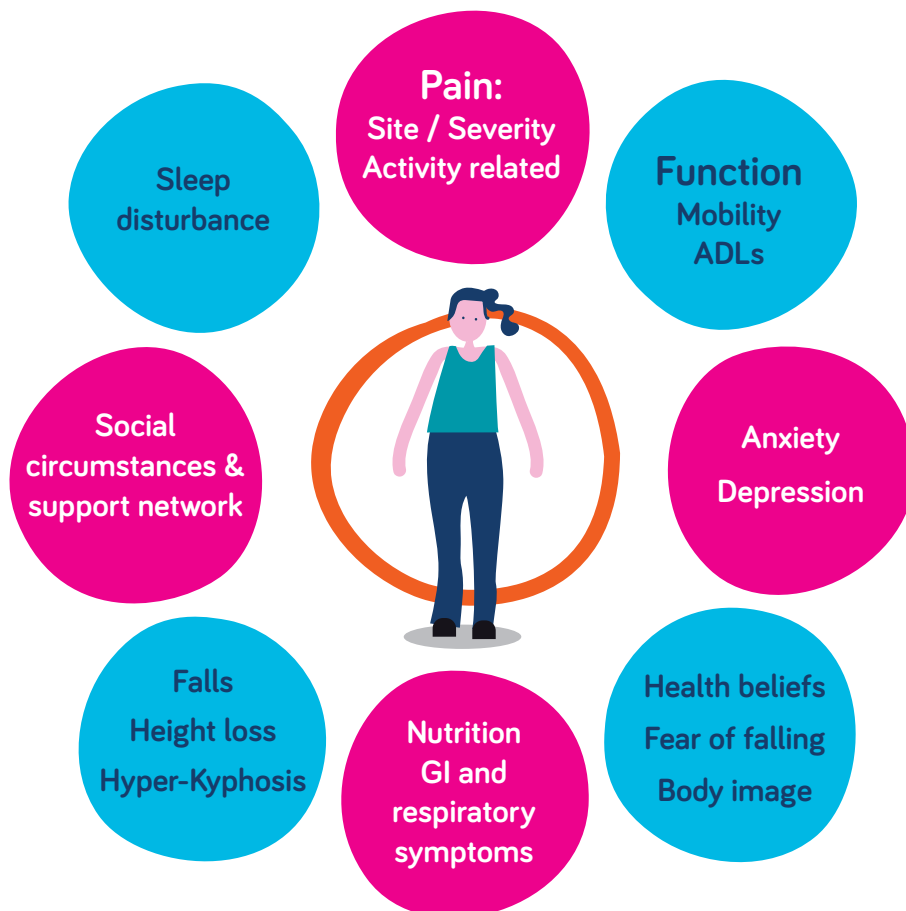
As part of the assessment patients should receive accurate verbal and written information about osteoporosis and vertebral fracture to enhance their understanding of the condition and its management. They should also be advised that:

- they and their family members or carers (as appropriate) will be involved in shared decisions about their care.
- they will be provided with ongoing care and support.

All patients with vertebral fracture should have a holistic assessment to determine the impact of the fracture(s) on pain, physical functioning and quality of life (see figure 2).

Patients with symptomatic vertebral fracture (and their family members or carers as appropriate) should be involved in shared decisions about their care.

Figure 2: Symptomatic Vertebral Fracture : Assessment



Pain

While pain from acute fracture may last up to three months, up to 50% of patients diagnosed with acute vertebral fracture have pain which persists beyond 6 months and can be considered chronic.⁽²⁹⁻³³⁾ Among those admitted to hospital, almost 76% had significant pain after 12 months, and only 10% reported no or very little pain.⁽³⁰⁾

Pain assessment

In assessment of pain it is important to consider both characteristics of the pain including its location and intensity, and also the impact of the pain on a patient's life including daily activities, lifestyle and sleep disturbance. Consideration should be given to pain experienced at rest and during activity.

Pain intensity may be assessed using a numeric rating scale (NRS) and/or a functional pain assessment score such as the Functional Activity Score (or PAINAD for patients with dementia).^(34,35)

Consider also assessment of psychological risk factors (using relevant assessment tools as appropriate) including anxiety and low mood (e.g. Hospital Anxiety and Depression Scale ⁽³⁶⁾), and pain catastrophising (e.g. Pain Catastrophising Scale ⁽³⁷⁾) that could increase the risk of persistent pain and disability.

Chronic pain can be complicated also by the patient's mood, perception of pain, experience, circumstances, and fear. Where appropriate, and depending on the assessment, consider referral to a health professional with expertise in pain and psychological factors.

The risks and benefits of pharmacological and non-pharmacological therapies should be explained to patients, taking into account their individual circumstances and underlying comorbidities.

Pharmacological therapy

Analgesics

Analgesic therapy should be individualized and directed at relieving pain, improving quality of life and increasing function.^(38,39)

General measures include short-term bed rest and pain relief with paracetamol and weak opioids as appropriate (see Table). A few days of bed rest might be indicated in presence of severe pain immediately after the fracture but prolonged or continuous bed rest should be limited as much as possible to reduce the risk of losing bone and muscle strength due to immobilisation.

In the acute fracture phase, pain is typically most intense and therapy should be escalated quickly based on treatment response. See table for a suggested guidance.

When assessing pain with a patient take account of both pain at rest and pain during activity.

Analgesia for vertebral fracture pain

Mild pain NRS $\leq 3/10$ ¹ No/mild limitation compared to normal activity	Paracetamol +/- weak opioids ² +/- NSAIDs ²
Moderate pain NRS 4-6/10 ¹ Mild/moderate limitation compared to normal activity	Paracetamol +/- opioids ² +/- NSAIDs ² +/- adjunct therapy ³
Severe pain NRS $> 6/10$ ¹ Severe limitation compared to normal activity	Paracetamol Opioids ² +/- NSAIDs ² +/- adjunct therapy ³

NRS: Numeric Rating Scale

1: This could pertain to current pain at rest or during activity.

2: Cautions: Polypharmacy risks, adverse effects, abuse, addiction potential especially with opioids.^(17,30,35,38-40)

3: Adjunct therapies contribute to mitigating pain, increasing the effect of analgesics.

For optimised medicines use a number of challenges need to be addressed, including: polypharmacy and drug burden issues, de-prescribing, possible drug interactions, side effects and any patient compliance or adherence challenges. (See [NICE Medicines Optimisation guideline NG5](#) and [NICE Medicines Adherence guideline CG76](#)).^(41,42)

Paracetamol

For acute and chronic pain, where long term use may be needed, paracetamol is currently the safest option.

Consider offering paracetamol for pain; regular dosing may be required. Paracetamol should be considered ahead of oral NSAIDs, cyclo-oxygenase 2 (COX-2) inhibitors or opioids.

If paracetamol is insufficient for pain relief then the addition of opioid analgesics and NSAIDs should be considered. The risks and benefits of such therapy should be considered, particularly in older people and those with significant comorbidities.

Opioids

For pain which is not controlled with paracetamol, opioids should be considered. Use in the acute stages of a fracture helps with pain control, with improved mobilisation and quality of life.⁽⁴³⁾ Doses can be titrated based on the patient's perceived pain score, bearing in mind the potential for overuse and addiction with higher doses and long-term use.

Significant side effects, associated with opioid use, include cardiorespiratory depression, gastrointestinal disturbance including constipation, headache, delirium, and increase in risk of falls and fractures.^(40,44,45) For patients taking therapy consider co-prescribing therapy to reduce the risk of constipation.

Transdermal opioid patches may be more tolerable than oral opioids, particularly in older people. They have a lower risk of the side effects associated with oral opiates.

For many patients, particularly those with significant co-morbidity, polypharmacy remains an area of concern. These patients benefit from regular medicines review, optimisation, and de-prescribing as appropriate.⁽⁴⁴⁾ When making shared decisions about discontinuing opioids, discuss any potential problems associated with withdrawal with the patient.

Note: Tramadol is not recommended as first-line opioid treatment and should only be recommended after specialist review. This is of particular importance for older patients who may be more sensitive to its adverse effects and are more likely to experience drug interactions due to polypharmacy.^(46,47)

NSAIDs

Cautions with NSAIDs and cyclo-oxygenase 2 (COX-2) inhibitors-use include gastrointestinal bleeding, kidney injury and cardiovascular risks, particularly in older people.⁽⁴⁸⁾ Any planned use should be for the shortest possible duration, and only given with PPI cover where clinically appropriate.

Adjunct therapies

Muscle relaxants

Muscle relaxants (for example, low dose short-term diazepam) used as an adjunct therapy in the acute setting may help break the cycle of moderate to severe pain and muscle spasm.^(49,50) They should be used for the shortest time possible, and not be used in patients with mild pain (NRS<3). Side effects include drowsiness and long-term dependency. Every patient should have an individualised risk benefit evaluation before beginning therapy.

Calcitonin for acute vertebral fracture pain

There is insufficient evidence to recommend use of calcitonin injections for pain relief. However, they may be considered in individual cases in the acute setting when other analgesic options have been exhausted.^(51,52) The limited evidence relates to use in the acute phase (within the first four weeks of fracture).

Central acting therapies

Central acting therapies such as tricyclic anti-depressants and neuropathic pain medicines such as gabapentin or pregabalin may be considered in patients with persistent pain which is uncontrolled with analgesics, after a full discussion of the potential benefits and harms.^(53,54) For neuropathic medications, consideration should be given to possible increased risk of sedation, dizziness and falls, particularly in frail and elderly patients.⁽⁵⁵⁾

For patients with chronic pain taking neuropathic medication, a medication review should be undertaken to support the patient to wean themselves off. These patients may benefit from counselling support, especially if dealing with anxiety and fear of further fracture.

For persistent severe pain consider use of centrally acting therapies including tricyclic anti-depressants and gabapentin after discussion about the potential risks and benefits. If pain persists and remains a management problem consider referral to multidisciplinary pain management team.

Bone targeted therapies for acute vertebral fracture pain

Patients with vertebral fracture should be assessed for underlying osteoporosis and treated appropriately. Pamidronate⁽⁵⁶⁻⁵⁸⁾, denosumab^(59,60) and teriparatide⁽⁶¹⁻⁶⁵⁾ have been assessed for their role in pain control ; however there is currently insufficient evidence that these or other anti-resorptive or anabolic therapies used in the management of osteoporosis can be used as treatments for vertebral fracture pain.

Non-pharmacological therapy

Orthoses and Taping

Bracing (e.g. rigid, dynamic, or soft orthoses) should not be recommended routinely for patients with osteoporotic vertebral fractures and should be avoided in chronic stages post-fracture. Some clinicians believe that the use of a soft brace intermittently in the acute stage reduces fear or gives confidence to mobilize or resume activities. If used, bracing should only be for short periods, and in combination with muscle strengthening exercise. There is insufficient evidence at present to recommend the use of taping for pain relief.

TENS, acupuncture and local heat

There is insufficient evidence that either TENS or acupuncture are effective in the management of pain associated with vertebral fracture. However, these therapies have been used in management of other pain conditions and can be considered as part of a holistic approach to reduce pain in patients with fracture. Further research is needed to determine the impact of these therapies on pain following vertebral fracture. Similarly, the application of heat and cold, using water bottles, heat pads and ice packs can be used to ease pain (using cloth covers to avoid damage to the skin).

Vertebral augmentation

In England and Wales, NICE recommends vertebral augmentation (VA) as an option for treating osteoporotic vertebral compression fractures only in people: who have severe ongoing pain after a recent, unhealed vertebral fracture despite optimal pain management and in whom the pain has been confirmed to be at the level of the fracture by physical examination and imaging.⁽⁶⁸⁾ In Scotland, VA is currently not recommended by the Scottish Intercollegiate Guidelines Network (SIGN).

The Evidence-Based Interventions (EBI) Programme is a clinical initiative led by the

Academy of Medical Royal Colleges (AoMRC) in partnership with NHS England and NHS Improvement (NHSE&I), as well as NHS Clinical Commissioners and NICE. The aim of the EBI programme is to improve the quality of care being offered to patients by reducing unnecessary interventions and preventing avoidable harm. The 2019 recommendation by the EBI was that VA may be considered as a treatment for painful osteoporotic vertebral fractures on a case-by-case basis. This was further endorsed by the more recent NHSE&I Best MSK guidance, which recommends VA for the very small number of patients who are admitted to hospital, where pain is unremitting after 48 hours and severely compromising activities of daily living and mobility in spite of initiation of therapy and acute pain management and where there is evidence of vertebral body edema on MRI imaging (See [NHSE&I Best MSK guidance](#)).

In all patients the decision to treat with VA, should be taken only after multidisciplinary team discussion, full explanation with the patient of the risks and benefits and at a facility with access to spinal surgery services. It is important also that patients undergoing VA enter a secondary fracture prevention pathway to prevent further fractures.

Persistent and poorly controlled pain

For individuals who experience persistent pain following vertebral fracture that is poorly controlled with pharmacological and non-pharmacological therapy, consider further imaging of the spine (radiographs/MRI) to exclude further fractures, fracture non-union and other possible causes of pain. Consider referral to an interdisciplinary pain management clinic which includes a physician with expertise in pain management and a psychologist that specializes in biopsychosocial pain management.

For hospitalised patients where pain is unremitting after 48 hours and severely compromising activities of daily living and mobility in spite of initiation of therapy and acute pain management, and where there is evidence of vertebral body oedema on MRI imaging consider referral for vertebral augmentation.

Exercise

Exercise after a vertebral fracture may help to reduce pain, improve muscle strength and balance, reduce fear of falling, and generally improve the quality of life of patients.^(1,69) It is important to reassure patients that there is little evidence of harm, including fractures, occurring during exercise.⁽⁷⁰⁾ An empowering and reassuring approach by healthcare professionals is recommended to reduce fear, and enhance confidence and control – ‘how to’ rather than ‘don’t do’. The focus should be on modification of exercises and safe movement.^(1,69)

In the acute setting advice about moving, exercise and physical activity should be provided promptly without waiting for referral to specialist services.

Consider referral to a physiotherapist if, in the acute setting, the patient’s pain is severe, and they are unable to mobilise and manage daily activities.

Healthcare professionals should consider referral to a physiotherapist in the acute setting if the pain is severe and the patient is unable to mobilise and manage daily activities.

There is evidence that as the fracture heals and the acute pain improves, progressive resistance training may address activity limitations and improve physical functioning in individuals with vertebral fracture.^(71,72) There is also strong evidence that balance and functional training, with or without resistance training, can prevent falls in older adults.⁽⁷³⁾ There are however very few data concerning the effects of exercise on falls, BMD or fracture in people with vertebral fractures.

Individualised exercise programme

An individualised exercise programme can be introduced 4-12 weeks after vertebral fracture, as tolerated, or when acute fracture-related pain has diminished, or after 12 weeks (when most fractures will have healed), based on patient preference and clinician judgement. Appropriateness of exercises may vary depending on location and severity of fractures, the patient’s physical health, functional status, time-post fracture, time on therapy and whether there is residual pain. The programme should focus on goals such as improving back extensor endurance, balance and physical functioning.

All patients should be considered for an individualised exercise programme 4-12 weeks after vertebral fracture, as tolerated; or when acute fracture-related pain has diminished, or after 12 weeks (when most fractures will have healed), based on patient preference and clinician judgement. The exercise programme should focus on goals such as improving back extensor endurance, balance and physical functioning.

After the fracture has healed, all patients should initiate a progressive balance and strength training programme.

When pain has diminished and the fracture has healed, all individuals with vertebral fracture should initiate an individualised and progressive balance, functional and resistance training programme.

For all patients consider referral to an appropriate exercise professional or physiotherapist for a tailored exercise programme, so that exercises can be informed by a baseline assessment and tailored to the patient's needs. Consideration will need to be given to health conditions, abilities, fracture type and symptoms, and time post-fracture.

The exercise programme should target back extensor endurance, spinal mobility, physical functioning, and balance. The exercise should focus on form prior to progressing intensity.⁽¹⁶⁹⁾ See [Appendix A](#). The exercise programme should, after the fracture has healed, be graduated to a progressive balance and strength training programme.

Detailed guidance for healthcare professionals on exercise as an intervention for osteoporosis is available:

- ROS Guidance [Strong, Straight and Steady guidance](#) ⁽⁷⁰⁾
- NHS Scotland [SIGN guidance on osteoporosis](#) ⁽⁶⁷⁾

Other activities and sports

If the patient wants to engage in physical activities or sports, or if they have a history of these activities, they should be encouraged *if it can be performed safely or modified appropriately* (e.g. modifying a golf swing to avoid end-range twisting, using mid-range spine flexion and extension in yoga or Pilates postures and avoiding end-range flexion such as touching toes and sit ups).^(1,69,74,75)

Wherever possible, patients should be encouraged to resume these activities in addition to, and not instead of, exercises for balance, muscle strength or posture. The patient is encouraged to discuss their options with a health care provider.

See exercise advice for patients in [Resources for patients](#)



Other symptoms and features

Hyperkyphosis

Following a vertebral fracture and particularly after more than one fracture, some individuals may develop hyperkyphosis or “an exaggerated anterior curvature of the thoracic spine.”⁽⁷⁶⁾ This may result in:

- Functional impairment.
- Abdominal protrusion and discomfort.
- Breathlessness; data suggests that a vertebral fracture is associated with a 9% reduction in forced vital capacity.^(77,78)
- Psychological effects including low self-esteem and body image issues.
- Increased force on vertebrae when lifting external loads, such as groceries, laundry or weights, resulting in pain and/or increased fracture risk.⁽⁷⁹⁾
- An increased risk of falls.
- Reduced force-generating capacity due to the back extensor muscles being in a lengthened position.
- Increased risk of non-spine fractures (often a result of a fall), even after adjusting for risk factors or prevalent vertebral fractures.⁽⁸⁰⁾

Assessment of spinal alignment

In clinical practice spinal alignment is best assessed by visual inspection of the spine from the front and side during usual posture and “standing tall” posture. Features to look for include forward head posture, humerus internal rotation, scapular protraction, and also exaggerated curvature of the thoracic spine. Patients with hyperkyphosis typically will have a history of height loss^(81,82) and on assessment the wall-occiput distance is typically >0cm, however, these features are not specific for the presence of hyperkyphosis.

Management

An exercise programme targeting spinal mobility, spinal extensor muscle weakness, posture, recruitment and activation of the spinal extensor muscles can reduce thoracic hyperkyphosis, improve quality of life, physical functioning and back extensor strength. This is recommended alongside strength training and balance exercises.^(76,83) Where available, referral to a physiotherapist should be considered. See [Appendix A](#) for detailed information regarding exercises.

For patients with significant activity limitations, for example, difficulty dressing and self-care, consider referral to an occupational therapist.

Pulmonary symptoms

Some people with vertebral fractures may experience breathlessness. This may be caused in part by the pain they experience and/or the reduction in vital capacity due to a reduction in thoracic height and hyperkyphosis which restricts movement in the chest so that they cannot inhale deeply. It is important that before ascribing such symptoms as due to osteoporosis and vertebral fractures that other possible causes of breathlessness are excluded (e.g. cardiovascular, other respiratory disease).

Management

An exercise programme targeting spinal mobility and muscle strength may help reduce hyperkyphosis and improve symptoms of breathlessness. Breathing exercises can also be used to manage symptoms:

- The patient should lie in the supine position with knees bent and feet flat on lying surface. On inhalation through the nose, they should focus on lower rib expansion and diaphragm contraction. Then exhale slowly with focus on the lower ribs moving in, and the pelvic-floor and deep abdominal muscles contracting. To progress this exercise, practice the exercise during sitting or standing.
- See video in [Resources for patients](#)

Urinary and gastrointestinal symptoms

Some people, particularly those with multiple vertebral fractures may experience stress incontinence or urgency due in part to changes in spinal shape with a reduction in lumbar height and increased abdominal pressure.

Loss of appetite may occur due to pain, adverse effects of medications and also early satiety – a feeling of being full despite a relatively small amount of food being consumed.⁽⁸⁴⁾ Patients may lose weight as a result, which can lead to loss of bone and muscle. Constipation may be related to relative inactivity and as an adverse effect of pain therapies. As with other systemic symptoms it is important to exclude other possible causes of these symptoms.

Management

Healthcare professionals should recommend pelvic floor muscle training to help individuals experiencing incontinence.^(85,86)

When weight loss or early satiety occur, consider the strategies below:

- Eating smaller and more frequent meals may help with loss of appetite and early satiety.
- Weight monitoring.
- Assess and advise about recommended daily intake of protein, calcium and vitamin D.
- Consider how functional impairments may impact food-related activities (e.g., bending over in the kitchen, standing in the kitchen, grocery shopping etc.), and develop a plan to address this, or refer to an occupational therapist.
- Food fortification by means of natural (e.g., eggs, oil, avocado, milk powder, nuts, nut butters), or specific nutrient preparations (e.g., protein powder, energy bars).
- Texture-modified foods if oral consumption is energy consuming.
- Create an eating environment that supports food intake (e.g., preparation of appealing food).
- Increasing variety in diet, considering individual food preferences.
- Referral to a dietitian as appropriate.

Psychological symptoms

Fear of another vertebral fracture or of falling is common in patients who have experienced a vertebral fracture. It can prove a barrier to participation in exercise or physical activities.⁽⁸⁷⁻⁹⁰⁾ Fear, pain and activity limitations (not being able to sit for long or climb stairs for example) may influence social or work activities and contribute to loneliness and anxiety.⁽⁸⁷⁾ Fracture-related changes to the body, such as hyperkyphosis, a protruding abdomen or loss of height may cause some individuals to have body image concerns.^(87,90)

Assessment

See [Pain Assessment](#) on assessment of pain-related psychological factors including catastrophising, anxiety and low mood. Other psychological factors to consider include pain-related fear, lack of confidence, social isolation and issues around body image. Fear of falling can be assessed using the Falls Self-efficacy Scale International – short-form (FES – I).⁽⁹¹⁾ This can be accessed at: [FES-I | Falls Efficacy Scale – International \(manchester.ac.uk\)](#)

Managing psychological symptoms

1. All patients should receive education on pain expectation. It may help the patient to understand how pain can settle and why it may recur. Explain that the severe pain after the fracture will diminish, and that as it heals, the pain is more likely to be related to surrounding structures e.g. muscle spasm, ligament strain or nerve involvement due to permanent changes to the shape of the spine. See also [Supporting Self-Management](#)

Assess for the presence of psychological factors including anxiety, low mood and pain catastrophising which may influence the occurrence and persistence of symptoms. Consider also the presence of pain-related fear, lack of confidence, fear of falling, and concerns about body image. Acknowledge the presence of these symptoms and provide support and therapy.

2. To increase confidence, healthcare professionals should provide examples of safe movement and activities that can be modified (e.g., bend at your hips instead of rounding your back, get someone to lift heavy objects for you instead of doing it yourself). It is important that healthcare professionals:

- use “how to” language rather than only focusing on activity restrictions
- are mindful of using words that promote optimism rather than create fear and activity avoidance.⁽⁷⁰⁾ See also [Supporting Self-Management](#)

All patients should receive education on pain expectation. It may help the patient to understand how pain can settle and why it may recur.

3. For individuals with fear-related beliefs (fear of pain, fractures, falling, movement), consider:
 - a tailored exercise programme with a focus on balance and functional training (see [Appendix A](#))
 - education on coping techniques, body awareness, and spine safe movement strategies.
 - if body image is a concern, using education or approaches informed by cognitive behavioral therapy to enhance self-esteem and improve the perception of body image.
 - referring to the [ROS videos on vertebral fracture](#).
4. For patients with anxiety and depression consider referral to their primary care practitioner for assessment and management. Patients may access directly support as part of the Improving Access to Psychological Therapies (IAPT) programme.⁽⁹²⁾ Such support includes counselling, cognitive behavioural therapy, mindfulness or guided online therapy.

Falls and falls risk

Patients with vertebral fracture, particularly those with hyperkyphosis are at increased risk of falls and further fractures. This is in part due to weakness and difficulty maintaining an upright position, impaired balance and impaired lower extremity function though other factors may contribute including comorbidity and polypharmacy.^(76,93,94)

Assessment of fall risk and balance

Management of symptoms will be a priority after painful vertebral fractures, but an assessment of falls risk and balance should be considered. This may be undertaken by the primary health care provider or referral to a clinician who is able to perform this assessment.

Undertake a falls risk assessment and if the patient is at risk consider referral to an appropriate falls' prevention service.

The clinician should ask a standardized question that also clarifies that one does not have to hit the ground or be outside for it to count as a fall: "In the last year, have you tripped or lost your balance so that you landed on the ground, or something lower, like a piece of furniture or stair?" British Geriatrics Society Guidelines for fall prevention suggest that presenting with an acute fall, two or more falls in the last year, or gait and balance difficulties may be indicative of increased fall risk.⁽⁹⁵⁾

There are number of performance-based assessments of balance (Mini Balance Evaluation Systems Test, the Berg Balance Scale, or the Short Physical Performance Battery).⁽⁹⁶⁾ Proceed though with caution when using assessment of self-limited forward reach (i.e. to assess balance) especially in people with acute or painful fractures. Dynamic mobility tests include the Timed Up and Go test (TUG); and 4-metre or 10-metre gait speed tests. Lower extremity physical function tests include the five times sit-to-stand test, or 30 second chair stand test.

Management

All patients with vertebral fractures should be advised to include exercise for balance and muscle strength as part of their overall long term management plan (see [Appendix A](#) and [Exercise](#)).

Patients with a history of falls or who are assessed as being at significant increased risk of falls should be referred to their local falls assessment service for further assessment and management.

Supporting self-management

To support effective self-management, patients need accurate verbal and written information about osteoporosis and vertebral fracture. They should be reassured that vertebral fractures are typically stable with no injury to the spinal cord, and pain will resolve over time as the fracture heals. Patients should be encouraged immediately to resume their normal activities of daily living using safe movement principles, as tolerated. Once acute fracture pain has diminished, they should be encouraged to resume their usual physical exercise, leisure and work activities.

All patients should receive accurate verbal and written information about osteoporosis and vertebral fracture to enhance their understanding of the condition and how medication, nutrition, fall prevention and exercise are important in its management.

Use the following strategies and principles to guide patients in their self-management:

- Avoid prolonged or continuous bed rest. A few days of bed rest might be indicated in presence of severe pain immediately after the fracture but limit the duration of prolonged or continuous bed rest as much as possible. Explain to the patient that prolonged bed rest may lead to muscle weakness, increased pain, increased falls risk and general frailty.
- Temporarily avoid heavy physical exertion, lifting, or activities that exacerbate pain for 12 weeks following fracture. This includes: carrying shopping, lifting pets or children, gardening. When to resume will depend on the severity of fracture(s) and symptoms.
- Receive education on pain expectation, for example: that, for most people, pain and activity tolerance will get better over time, but it may take three months or longer; and that they can gradually start or resume exercise and physical activities of daily life, leisure, or work as pain diminishes.

All patients should receive advice, tools and support for effective self-management.

- Patients are often given advice not to lift things, or bend or twist the spine. However, these movements are often impossible to completely avoid in the daily life. Encourage the patient to seek education on safe movements during physical activities of daily life, leisure, and work (See [Appendix A](#) and video in [Resources for patients](#)). Where appropriate, seek access to a physiotherapist for assessment, treatment and education.

For patients with significant activity limitations, for example, difficulty dressing and self-care, consider referral to an occupational therapist.

- Avoid prolonged sitting and, and when sitting, do so with attention to posture during sitting, as well as getting in and out of the seated position (See [Appendix A](#) and ROS factsheets and videos).
- Avoid the use of bracing or taping as evidence of its efficacy is limited and might result in dependence or atrophy of back extensor or abdominal muscles with prolonged use. Reassure patients that vertebral fractures are typically stable with no injury to the spinal cord – therefore a brace is not needed to aid healing or prevent further injury.

Use pacing or 'graded activity' to facilitate increased activity tolerance, or to avoid doing too much too soon. See video and factsheets in [Resources for patients](#)

- Healthcare professionals should signpost the patient to ROS resources on safe movement and exercise. See [Resources for patients](#)

Signposting to the Royal Osteoporosis Society

All individuals with a history of vertebral fragility fracture should be signposted to sources of information which help them learn about their condition and to manage their symptoms. The Royal Osteoporosis Society (ROS) provides a wide range of information resources, both printed and digital, about pharmacological and non-pharmacological management of symptoms, and also about reducing the risk of further fractures. Patients can also learn more about osteoporosis, its treatment, other people's experiences and how they manage to live well with the condition. Specialist nurses at ROS can provide support either by email or on the free telephone helpline. Healthcare professionals can also refer patients to the charity for information about exercise, day to day living and coping with the impact of kyphosis. ROS can offer patients access to peer support.

ROS provides a range of printed resources, videos and information at www.theros.org.uk. Patients can request a list of all resources.

Specialist Osteoporosis Nurse Helpline: 0808 800 0035 or email: nurses@theros.org.uk



Resources for patients

All individuals with a history of vertebral fragility fracture should be signposted to sources of information which help them learn about their condition and to manage their symptoms.

Relevant ROS Information resources

Pain and symptoms

- [Living with spinal fractures videos](#)
- [Help for pain and other symptoms caused by spinal fractures](#) – booklet
- [Managing persistent pain after fractures \(pacing/relaxation\) fact sheet](#)
- [Pain relieving drugs after fractures fact sheet](#)
- [Complementary therapies for pain after fractures fact sheet](#)
- [Daily living after fractures \(breathing exercises\) fact sheet](#)
- [Out and about after fractures fact sheet](#)
- [Exercise for back pain after fractures and Exercise video for back pain after spinal fractures](#)
- [Exercises to help with posture and Exercise video to help with posture](#)
- [Clothing and body image fact sheet](#)

Exercise fact sheets and videos

- [About exercise](#)
- [Before & after exercise factsheet](#) and [Warm up exercises video](#) and [Cool down stretches video](#)
- [Exercises to promote bone & muscle strength factsheet](#) and [Bone and muscle strength exercise video](#)
- [Exercises to improve balance & muscle strength factsheet](#) and [Improving balance and muscle strength video](#)
- [Exercise for back pain after fractures factsheet](#) and [Exercise video for back pain after spinal fractures](#)
- [Exercises to help with posture factsheet](#) and [Exercise video to help with posture](#)
- [Moving & lifting safely factsheet](#) and [Moving and lifting safely videos](#)
- [Bending forward with osteoporosis factsheet](#) and [Bending forward video](#)
- [Pilates exercises with osteoporosis factsheet](#) and [Pilates exercises video](#)

Other resources

Breathing	Focus on breath video (Canada)
Pain & fatigue (pacing)	Using pacing to cope with fatigue video (Canada)
Continence	Pelvic floor exercises (NHS)
Exercise	Too fit to fracture (Canada) Exercise and bone health (Australia)
Psychological help	Talking therapies (NHS)

Other Considerations

Osteoporosis and secondary fracture prevention

Though not the subject of this guidance – patients with vertebral fractures require early assessment and appropriate intervention to prevent further fractures. All patients should be informed that having a vertebral fracture may increase their risk of a future fracture (including vertebral and non-vertebral fractures), and that this risk can be substantially reduced by treatment. They should talk to their doctor about assessing their risk, the treatment options available to them and the importance of adherence to treatment.

All patients with an identified vertebral fracture should receive:

- A fracture risk assessment using FRAX^{®*} or QFracture[®].⁽⁹⁷⁾
- An assessment of their falls risk with referral to a falls prevention service where appropriate.
- Relevant laboratory and imaging investigations to identify any underlying secondary causes of osteoporosis and inform treatment decisions.
- A dual energy X-ray absorptiometry (DXA) scan^{**} including vertebral fracture assessment.⁽²⁸⁾
- Information and support regarding osteoporosis, their risk factors for fracture, falls risk, drug treatment options including the risks and benefits.⁽²⁾
- Follow-up to ensure optimisation of treatment

All eligible patients should be considered for initiation of an appropriate drug treatment to reduce bone loss and the risk of future fractures. Oral and parenteral bisphosphonates, denosumab and teriparatide are recommended as cost-effective therapy for osteoporosis in national guidelines by NICE, SIGN and the National Osteoporosis Guideline Group (NOGG).^(67,98-100) Other therapies such as romosozumab may be available regionally.⁽⁶⁷⁾

All patients with a vertebral fragility fracture should be considered for fracture risk assessment where appropriate to reduce fracture risk and prevent further fractures.

* FRAX[®] limitations:

FRAX[®] may underestimate fracture risk:

- because vertebral fractures carry a relatively higher risk of subsequent fracture compared to non-vertebral fractures.
- where BMD is included in a FRAX[®] assessment, and the spinal BMD is lower than that of the femoral neck.

** DXA – important considerations:

- In patients with very high fracture risk therapy should not be delayed pending DXA BMD measurement.
- Measurement of BMD by DXA is not indicated where it would not alter the management of the patient- e.g. in very frail/elderly.
- DXA may be used where fracture risk assessment is equivocal or may meet criteria for anabolic treatment.
- VFA at DXA is not indicated where a patient has recent imaging that includes the lumbar and thoracic spine where the vertebral fracture was diagnosed.
- Lumbar spine BMD may be artificially elevated in patients with degenerative change, lumbar vertebra fractures or internal artefact such as instrumental fusion. Vertebral exclusions should be managed according to published standards (ROS reporting DXA standards [ros-reporting-dxa-scans-in-adult-fracture-risk-assessment-august-2019.pdf](#))

Appendix A: Exercise, Movements and Physical Activity

Acute healing phase 6-8- weeks (adapt according to pain severity)

Tips for moving and lifting

1. With very severe pain, bed rest may be necessary initially, but minimise and aim to gradually increase mobility.
2. Encourage regular analgesia to promote mobility
3. If sitting for long periods causes pain, aim to stand up every 30 minutes if possible.
4. Gradually increase periods of activities, resting regularly, lie down to relax for short episodes during the day if necessary.
5. Plan activities and aim for slower, smooth, controlled movements.
6. For sitting and bending, bend at the hips (hip hinge), knees and ankles rather than rounding the back.
7. Turning rather than over twisting the torso, step-to-turn so that trunk, knees and toes face the same direction.
8. There is no specific weight restriction but load should be reduced if strain is felt in the back. When holding objects in front, hold them close to the body.

Exercise for pain relief

The “unloading position” may help with pain.

Lie supine on the floor, bed or firm surface, with feet flat on surface and knees bent, to unload the spine, encourage spinal extension. Individuals with hyperkyphosis should use one or more pillows under the head. A frequency of 2-4 times per day for 15-20 minutes. Supine lying with a bolster under the knees could also be used to make sleeping more comfortable.

Gradual increase to include gentle exercises during the healing phase within pain limitations

See [ROS exercises for back pain fact sheet](#)

[And video](#)

Considerations

Anxiety is common and can be disabling during the early phase especially if pain has been very severe. Emphasise the positive approach that ‘cares for your back’ – sensible, easy amendments to movements and activities to help with pain

Patients will need immediate reassurance and advice that:

- normal moving and activities are unlikely to ‘cause’ or worsen vertebral fractures and won’t prevent healing.
- amending activity is primarily to prevent escalation of pain or triggering muscle spasm.
- some amendments avoid pressure on the anterior spine which might reduce further vertebral fracture BUT evidence is limited about which movements could cause fracture.

Specific caution

Individuals with acute lumbar compression fractures should avoid supine hip and leg extension, and hyperextension of the thoracic spine.

Movement and exercise after initial healing phase

Tips on movement after initial healing phase

- Continue with principles 2-8 above
- Avoid prolonged sitting – get up and move around every 30 minutes.
- Break up periods of standing especially for activities that involve slightly leaning forward.
- When holding something in each hand, distribute the weight evenly across both hands (e.g. shopping bags).
- Store objects at waist height to avoid lifting from low down. Use a step stool to reach high objects or get someone else to reach it.
- Consider seeking other strategies such as perched sitting or standing desks.
- When doing routines used in exercise programmes such as Pilates or Yoga avoid rapid, repetitive, weighted, sustained or end-range flexion or twisting of the spine, and reduce loads on the spine e.g., Sit ups, touching toes.^(75,101)

Exercise for relief of long term persistent pain

Consider referral to an exercise professional or physiotherapist for advice and guidance on individual exercises

Resistance training

Improving back extensor muscle endurance may help reduce muscle spasm and pain. An exercise programme should initially focus on form and be progressive. For example:

- Exercises to improve posture or endurance for standing upright without pain (exercises that target shoulder and pectoral girdle stabilizers and back extensor endurance), and to improve spinal and shoulder mobility (see examples on next page – exercises for hyperkyphosis).
- Back extensor exercises can be performed in supine and progressed to exercises in standing or quadruped, and often include reaching or extending the upper or lower limbs to achieve thoracic or lumbar extension (hold 3-10 seconds, multiple sets).
- Resistance training exercises to improve muscular strength of upper and lower extremities.

To promote bone strength and improved physical functioning, if pain has ceased and with gradual supervised progression: moderate intensity (i.e., 70-80% of estimated 1 repetition maximum (RM), or 8-12 RM, determined during baseline assessment – an estimated 1 RM is suggested as the safety of 1 RM testing has not been established).

Other exercise

Water based exercise (hydrotherapy) may help improve quality of life in patients with osteoporosis / osteopenia though has not been formally tested in patients with vertebral fracture.⁽¹⁰³⁾

Balance exercises

- Static and dynamic balance exercises.
- Tai Chi

See [ROS fact sheets and video](#)

Other activities

Patients should continue to enjoy the physical activities they enjoyed pre-fracture (such as walking, gardening and golf) if they can be performed safely (and modified if necessary). There is low certainty evidence that Pilates can improve physical functioning and quality of life in older adults.

Patients should be encouraged to meet national physical activity guidelines to gain other health benefits.

Comprehensive information can be found at: ROS Guidance [Strong Straight and Steady](#)⁽⁷⁰⁾

Information for patients:

[ROS fact sheets and videos](#)

NHS Scotland guidance on osteoporosis:⁽⁶⁷⁾
<https://www.sign.ac.uk/media/1812/sign-142-osteoporosis-v3.pdf>

Giangregorio LM et al (2015)
[Too Fit To Fracture](#)

Exercises for hyperkyphosis

Consider referral to an exercise professional or physiotherapist for advice and guidance on individual exercises

Example exercises from a study that reported reduced hyperkyphotic posture. Performed at 70-80% of perceived exertion (Borg scale intensity of 4 to 5):

- 'Bird dog' or modified bird dog (extending one arm and contralateral leg, while keeping torso stable, either in standing at a counter or on hands and knees),
 - side lying thoracic rotation/extension,
 - exercises on roller (e.g., unilateral overhead reaching, bilateral pulldown, transversus abdominis activation, chest stretch),
 - wall push-ups,
 - shoulder flexion/extension,
 - single leg stance,
 - daily postural correction practice,
 - diaphragmatic breathing, and
 - stretching for gluteal, quadriceps, chest muscles.⁽⁶⁵⁾

Considerations

Resume activities involving heavy physical exertion gradually.

When returning to using weights, there isn't a specific weight limit; patients should avoid maximal or near-maximal exertion lifting, use good judgement on their risk and capacity, and use safe lifting principles.

Specific cautions

- Bridging in supine should be done with care to avoid over flexion of the thoracic spine.
- Supine exercises should be performed with a neutral cervical spine position; use one or more pillows to prevent cervical hyperextension in people with hyperkyphosis.
- Weighted overhead movements should only be done with careful progression and attention to form, and only if sufficient shoulder range of motion permits good form.

Appendix B: Other Clinical Resources

Identification

[ROS Clinical Guidance for the Effective Identification of Vertebral Fractures](#)

1. Patients with vertebral fracture are typically identified in one of three ways:
 - Patients present to a healthcare setting with symptoms suggestive of vertebral fracture
 - Patient has an imaging investigation for an indication unrelated to the spine
 - Patient attends for bone densitometry as part of osteoporosis or secondary fracture prevention pathway

In each there is spinal imaging obtained, evaluated and the fracture identified.

2. Vertebral appearances are reported in imaging departments as:
 - Vertebral fracture
 - Description of levels and severity
 - Previous imaging reviewed to identify timing of the fracture
 - Non-fracture vertebral deformity
 - Clear cause of deformity described e.g. degenerative change, Scheuermann's disease and Schmorl's nodes
 - Normal
3. Vertebral fracture reports signpost for further assessment for effective prevention of further fractures.

This may be through:

- case finding or local alert processes through appropriate bone or secondary fracture prevention services – such as FLS
- alerts to the referring clinician (for the original imaging) to manage or further referral for bone services.

Secondary fracture prevention

[ROS Effective Secondary Prevention of Fragility Fractures Guidance](#)

Secondary fracture prevention is a systematic clinical pathway usually delivered by Fracture Liaison Services and audited by the RCP Falls and Fragility Fracture Audit Programme [FLS-Database]⁽¹⁰⁴⁾ that:

- identifies people aged 50 years or older with a new fragility fracture which also includes:
 - Newly identified vertebral fracture.
 - A new fracture occurring whilst a patient is taking an osteoporosis drug treatment
- Investigates underlying causes for the fracture through:
 - fracture risk assessment including use of FRAX[®] or QFracture[®]
 - quality-assured axial DXA including a vertebral fracture assessment (VFA) where indicated.
 - An assessment of falls risk in people aged 65 or over.
 - Relevant laboratory and imaging investigations to identify any underlying secondary causes of osteoporosis and help inform drug treatment decisions.
- Initiates a management programme to treat underlying osteoporosis for people at high risk of fragility fracture
- Refers people at high risk of falling to falls prevention services
- Follows up patients to ensure that
 - Treatment has been started and taken appropriately.
 - Referral to falls reduction programmes have been actioned.

References

1. Ponzano M, Tobert N, Brien S, Funnell L, Gibbs JC, Keller H, et al. Ponzano, M., Tibert, N., Brien, S., Funnell, L., Gibbs, J.C., Keller, H., Laprade, J., Morin, S.N., Papaioannou, A., Weston, Z., Wideman, T.H., Giangregorio, L.M. International Consensus on the Non-pharmacological Management of Osteoporotic Vertebral Fractures – submitted.
2. Royal Osteoporosis Society (ROS). Effective Secondary Prevention of Fragility Fractures: Clinical Standards for Fracture Liaison Services [Internet]. 2019 [cited 2022 Jan 18]. Available from: <https://theros.org.uk/media/1eubz33w/ros-clinical-standards-for-fracture-liaison-services-august-2019.pdf>
3. Royal Osteoporosis Society (ROS). Clinical Guidance for the effective identification of vertebral fractures [Internet]. 2017 [cited 2022 Jan 7]. Available from: https://scholar.google.co.uk/scholar?hl=en&as_sdt=0%2C5&q=Clinical+Guidance+for+the+effective+identification+of+vertebral+fractures.&btnG=
4. SILVERMAN, SL. Health-Related Quality of Life Subgroup of the Multiple Outcomes of Raloxifene Evaluation Study. The relationship of health-related quality of life to prevalent and incident vertebral fractures in postmenopausal women with osteoporosis : results from Multiple Outcomes of Raloxifene Evaluation Study. *Arthritis Rheum* [Internet]. 2001 [cited 2022 Jan 7];44:2611–9. Available from: <https://ci.nii.ac.jp/naid/10029023715>
5. Cohen LD. Fractures of the Osteoporotic Spine. *Orthopedic Clinics of North America*. 1990 Jan 1;21(1):143–50.
6. Cooper C, Atkinson EJ, Jacobsen SJ, O'fallon WM, Melton LJ. Population-based study of survival after osteoporotic fractures. *Am J Epidemiol* [Internet]. 1993 May 1 [cited 2022 Jan 6];137(9):1001–5. Available from: <https://pubmed.ncbi.nlm.nih.gov/8317445/>
7. Kanis JA, Johnell O, Oden A, Sernbo I, Redlund-Johnell I, Dawson A, et al. Long-term risk of osteoporotic fracture in Malmo. *Osteoporosis International*. 2000;11(8):669–74.
8. O'Neill TW, Felsenberg D, Varlow J, Cooper C, Kanis JA, Silman AJ, et al. The prevalence of vertebral deformity in European men and women: The European vertebral osteoporosis study. *Journal of Bone and Mineral Research*. 1996;11(7):1010–8.
9. Felsenberg D, Silman AJ, Lunt M, Armbrecht G, Ismail AA, Finn JD, et al. Incidence of vertebral fracture in Europe: results from the European Prospective Osteoporosis Study (EPOS). *J Bone Miner Res* [Internet]. 2002 Jan 1 [cited 2022 Jan 6];17(4):716–24. Available from: <https://pubmed.ncbi.nlm.nih.gov/11918229/>
10. Curtis E, Velde R van der, Bone RM-, 2016 undefined. Epidemiology of fractures in the United Kingdom 1988–2012: variation with age, sex, geography, ethnicity and socioeconomic status. *Elsevier* [Internet]. [cited 2022 Feb 16]; Available from: <https://www.sciencedirect.com/science/article/pii/S8756328216300655>
11. Cooper C, Atkinson EJ, Michael O'Fallon W, Melton JL. Incidence of clinically diagnosed vertebral fractures: A population-based study in rochester, minnesota, 1985-1989. *Journal of Bone and Mineral Research*. 1992;7(2):221–7.
12. Klotzbuecher CM, Ross PD, Landsman PB, Abbott TA, Berger M. Patients with Prior Fractures Have an Increased Risk of Future Fractures: A Summary of the Literature and Statistical Synthesis. *Journal of Bone and Mineral Research* [Internet]. 2000 Apr 1 [cited 2022 Jan 6];15(4):721–39. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1359/jbmr.2000.15.4.721>
13. Melton LJ, Crowson CS, O'Fallon WM. Fracture incidence in Olmsted County, Minnesota: Comparison of urban with rural rates and changes in urban rates over time. *Osteoporosis International*. 1999;9(1):29–37.
14. Black DM, Arden NK, Palermo L, Pearson J, Cummings SR. Prevalent vertebral deformities predict hip fractures and new vertebral deformities but not wrist fractures. Study of Osteoporotic Fractures Research Group. *J Bone Miner Res* [Internet]. 1999 [cited 2022 Jan 6];14(5):821–8. Available from: <https://pubmed.ncbi.nlm.nih.gov/10320531/>
15. Gonnelli S, Caffarelli C, Nuti R, Maggi S, Siviero P, Crepaldi G, et al. The assessment of vertebral fractures in elderly women with recent hip fractures: the BREAK Study. *Springer* [Internet]. 2013 Apr [cited 2022 Jan 7];24(4):1151–9. Available from: <https://link.springer.com/article/10.1007/s00198-012-2119-2>
16. Jacobsen SJ, Cooper C, Gottlieb MS, Goldberg J, Yahnke DP, Melton LJ. Hospitalization with vertebral fracture among the aged: A national population-based study, 1986–1989. *Epidemiology* [Internet]. 1992 [cited 2022 Jan 6];3(6):515–8. Available from: <https://mayoclinic.pure.elsevier.com/en/publications/hospitalization-with-vertebral-fracture-among-the-aged-a-national>
17. Ong T, Kantachavesiri P, Sahota O, Gladman JRF. Characteristics and outcomes of hospitalised patients with vertebral fragility fractures: a systematic review. *Age and Ageing* [Internet]. 2018 Jan 1 [cited 2022 Jan 6];47(1):17–25. Available from: <https://academic.oup.com/ageing/article/47/1/17/3811072>
18. Walters S, Chan S, Goh L, ... TO-C rheumatology, 2016 undefined. The prevalence of frailty in patients admitted to hospital with vertebral fragility fractures. *ingentaconnect.com* [Internet]. [cited 2022 Jan 7]; Available from: <https://www.ingentaconnect.com/content/ben/crr/2016/00000012/00000003/art00013>
19. Ong T, Sahota O, Gladman JRF. The Nottingham Spinal Health (NoSH) Study: a cohort study of patients hospitalised with vertebral fragility fractures. *Osteoporosis International* [Internet]. 2020 Feb 1 [cited 2022 Jan 6];31(2):363–70. Available from: <https://link.springer.com/article/10.1007/s00198-019-05198-x>
20. Goldstein CL, Chutkan NB, Choma TJ, Orr RD. Management of the Elderly With Vertebral Compression Fractures. *Neurosurgery* [Internet]. 2015 Oct 1 [cited 2022 Jan 6];77 Suppl 4(4):S33–45. Available from: <https://pubmed.ncbi.nlm.nih.gov/26378356/>

21. Tsai Y, Hsiao F, Wen Y, Kao Y, ... LC-J of the A, 2013 undefined. Clinical outcomes of vertebroplasty or kyphoplasty for patients with vertebral compression fractures: a nationwide cohort study. Elsevier [Internet]. [cited 2022 Jan 7]; Available from: <https://www.sciencedirect.com/science/article/pii/S1525861012003179>
22. Borgström F, Karlsson L, Ortsäter G, Norton N, Halbout P, Cooper C, et al. Fragility fractures in Europe: burden, management and opportunities. *Archives of Osteoporosis*. 2020 Dec 1;15(1).
23. Dolan P, International DT-O, 1998 undefined. The cost of treating osteoporotic fractures in the United Kingdom female population. Springer [Internet]. 1998 [cited 2022 Jan 7];8(6):611–7. Available from: <https://link.springer.com/article/10.1007/s001980050107>
24. Borgström F, Zethraeus N, Johnell O, Lidgren L, Ponzer S, Svensson O, et al. Costs and quality of life associated with osteoporosis-related fractures in Sweden. *Osteoporosis International* 2005 17:5 [Internet]. 2005 Nov 9 [cited 2022 Jan 6];17(5):637–50. Available from: <https://link.springer.com/article/10.1007/s00198-005-0015-8>
25. Kanis JA, Norton N, Harvey NC, Jacobson T, Johansson H, Lorentzon M, et al. SCOPE 2021: a new scorecard for osteoporosis in Europe. *Archives of Osteoporosis*. 2021 Dec 1;16(1).
26. Al-Sari U, Tobias J, Clark EM, 2016 undefined. Health-related quality of life in older people with osteoporotic vertebral fractures: a systematic review and meta-analysis. Springer [Internet]. 2016 Oct 1 [cited 2022 Jan 7];27(10):2891–900. Available from: <https://link.springer.com/article/10.1007/s00198-016-3648-x>
27. Fink HA, Milavetz DL, Palermo L, Nevitt MC, Cauley JA, Genant HK, et al. What proportion of incident radiographic vertebral deformities is clinically diagnosed and vice versa? *Journal of Bone and Mineral Research*. 2005 Jul;20(7):1216–22.
28. Lems WF, Paccou J, Zhang J, Fuggle NR, Chandran M, Harvey NC, et al. Vertebral fracture: epidemiology, impact and use of DXA vertebral fracture assessment in fracture liaison services. *Osteoporosis International*. 2021 Mar 1;32(3):399–411.
29. Venmans A, Klazen CA, Lohle PNM, Mali WP, van Rooij WJ. Natural history of pain in patients with conservatively treated osteoporotic vertebral compression fractures: results from VERTOS II. *Am Soc Neuroradiology* [Internet]. 2012 Mar [cited 2022 Jan 7];33(3):519–21. Available from: <http://www.ajnr.org/content/33/3/519.short>
30. Paolucci T, Saraceni VM, Piccinini G. Management of chronic pain in osteoporosis: challenges and solutions. *Journal of Pain Research* [Internet]. 2016 Apr 1 [cited 2022 Jan 6];9:177. Available from: <https://pubmed.ncbi.nlm.nih.gov/PMC4824363/>
31. Sahota O, Ong T, Salem K. Vertebral Fragility Fractures (VFF)—Who, when and how to operate. *Injury*. 2018 Aug 1;49(8):1430–5.
32. Johansson L, Sundh D, Nilsson M, Mellström D, Lorentzon M. Vertebral fractures and their association with health-related quality of life, back pain and physical function in older women. *Osteoporosis Int* [Internet]. 2018 Jan 1 [cited 2022 Jan 6];29(1):89–99. Available from: <https://pubmed.ncbi.nlm.nih.gov/29143131/>
33. Nuti R, Brandi ML, Checchia G, di Munno O, Dominguez L, Falaschi P, et al. Guidelines for the management of osteoporosis and fragility fractures. *Internal and Emergency Medicine* [Internet]. 2019 Jan 24 [cited 2022 Jan 6];14(1):85–102. Available from: <https://link.springer.com/article/10.1007/s11739-018-1874-2>
34. Vannucci L, Fossi C, Gronchi G, Brandi ML. Low-dose diclofenac in patients with fragility fractures. *Clinical Cases in Mineral and Bone Metabolism* [Internet]. 2017 [cited 2022 Jan 7];14(1):15. Available from: <https://pubmed.ncbi.nlm.nih.gov/PMC5505708/>
35. National Institute for Health and Care Excellence (NICE). Fractures (non-complex): assessment and management NICE guideline [NG38] Published: 17 February 2016 [Internet]. 2016 [cited 2022 Jan 14]. Available from: <https://www.nice.org.uk/guidance/ng38>
36. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica* [Internet]. 1983 Jun 1 [cited 2022 Mar 23];67(6):361–70. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1600-0447.1983.tb09716.x>
37. Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and Validation. *Psychological Assessment*. 1995;7(4):524–32.
38. Enthoven WTM, Roelofs PDDM, Deyo RA, van Tulder MW, Koes BW. Non-steroidal anti-inflammatory drugs for chronic low back pain. *Cochrane Database Syst Rev* [Internet]. 2016 Feb 10 [cited 2022 Jan 6];2(2). Available from: <https://pubmed.ncbi.nlm.nih.gov/26863524/>
39. Zajączkowska R, Kocot-Kępska M, ... WL-I journal of, 2019 undefined. Bone pain in cancer patients: mechanisms and current treatment. *mdpi.com* [Internet]. 2019 Dec 1 [cited 2022 Jan 7];20(23). Available from: <https://www.mdpi.com/585378>
40. Spiegl UJ, Fischer K, Schmidt J, Schnoor J, Delank S, Josten C, et al. The Conservative Treatment of Traumatic Thoracolumbar Vertebral Fractures. *Deutsches Arzteblatt international*. 2018 Oct 19;115(42):697–704.
41. National Institute for Health and Care Excellence (NICE). Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes NICE guideline. 2015 [cited 2022 Jan 12]; Available from: www.nice.org.uk/guidance/ng5
42. National Institute for Health and Care Excellence (NICE). Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence. Clinical guideline [CG76] [Internet]. 2009 [cited 2022 Jan 6]. Available from: <https://www.nice.org.uk/guidance/cg76>

43. Vorsanger GJ, Farrell J, Xiang J, Chow W, Moskovitz BL, Rosenthal NR. Tapentadol, oxycodone or placebo for acute pain of vertebral compression fractures: a randomized Phase IIIb study. *Pain Management*. 2013 Mar;3(2):109–18.
44. Tanna N, Tatla T, Winn T, Chita S, Ramdoo K, Batten C, et al. Clinical Medication Review and Falls in Older People—What Is the Evidence Base? *Pharmacology & Pharmacy* [Internet]. 2016 Feb 22 [cited 2022 Jan 7];7(2):89–96. Available from: <http://www.scrip.org/journal/PaperInformation.aspx?PaperID=63607>
45. Longo UG, Loppini M, Denaro L, Maffulli N, Denaro V. Conservative management of patients with an osteoporotic vertebral fracture: A review of the literature. *Journal of Bone and Joint Surgery – Series B*. 2012 Feb;94 B(2):152–7.
46. Tramadol | Interactions | BNF content published by NICE [Internet]. [cited 2022 Jan 17]. Available from: <https://bnf.nice.org.uk/interaction/tramadol.html>
47. Gibbison B, Bailey C, Anaesthesia AK-, 2015 undefined. Tramadol – the Marmite™ drug. *Anaesthesia* [Internet]. 2015 Feb [cited 2022 Jan 17];70(2):125–30. Available from: http://www.jvsmedicscorner.com/Anaesth-Pharmacology_files/Tramadol%20%E2%80%93%20the%20MarmiteTM%20drug.pdf
48. Dodwell ER, Latorre JG, Parisini E, Zwettler E, Chandra D, Mulpuri K, et al. NSAID Exposure and Risk of Nonunion: A Meta-Analysis of Case-Control and Cohort Studies. *Calcified Tissue International* 2010 87:3 [Internet]. 2010 Jun 15 [cited 2022 Jan 14];87(3):193–202. Available from: <https://link.springer.com/article/10.1007/s00223-010-9379-7>
49. Akita K, Kumakura Y, Nakajima E, Ishiguro H, Iijima T. Clonazepam for pain due to muscle spasm in a patient with vertebral compression fractures caused by multiple myeloma: a case report. *JA Clinical Reports*. 2021 Dec 1;7(1).
50. Joint Formulary Committee. *British National Formulary* (online) London: BMJ Group and Pharmaceutical Press <<http://www.medicinescomplete.com>> [Accessed on [date]]. Joint Formulary Committee. *British National Formulary* (online) . Joint Formulary Committee. *British National Formulary* (online) London: BMJ Group and Pharmaceutical Press <<http://www.medicinescomplete.com>> [Accessed on [date]].
51. Knopp JA, Diner BM, Blitz M, Lyritis GP, Rowe BH. Calcitonin for treating acute pain of osteoporotic vertebral compression fractures: a systematic review of randomized, controlled trials. *Osteoporosis International* 2004 16:10 [Internet]. 2004 Dec 22 [cited 2022 Jan 26];16(10):1281–90. Available from: <https://link.springer.com/article/10.1007/s00198-004-1798-8>
52. Kendler DL, Bauer DC, Davison KS, Dian L, Hanley DA, Harris ST, et al. Vertebral Fractures: Clinical Importance and Management. *The American Journal of Medicine*. 2016 Feb 1;129(2):221.e1-221.e10.
53. Prather H, Hunt D, Watson JO, Gilula LA. Conservative Care for Patients with Osteoporotic Vertebral Compression Fractures. *Physical Medicine and Rehabilitation Clinics of North America*. 2007 Aug 1;18(3):577–91.
54. National Institute for Health and Care Excellence (NICE). Neuropathic pain in adults: pharmacological management in non-specialist settings Clinical guideline [CG173] [Internet]. 2013 [cited 2022 Jan 6]. Available from: <https://www.nice.org.uk/guidance/cg173/chapter/Introduction>
55. Schmadler KE, Baron R, Haanpää ML, Mayer J, O'Connor AB, Rice ASC, et al. Treatment Considerations for Elderly and Frail Patients With Neuropathic Pain. *Mayo Clinic Proceedings* [Internet]. 2010 [cited 2022 Feb 18];85(3 Suppl):S26. Available from: </pmc/articles/PMC2844008/>
56. Armingeat T, Brondino R, Pham T, Legré V, Lafforgue P. Intravenous pamidronate for pain relief in recent osteoporotic vertebral compression fracture: A randomized double-blind controlled study. *Osteoporosis International*. 2006 Nov;17(11):1659–65.
57. Gangji V, rheumatology TA-C, 1999 undefined. Analgesic effect of intravenous pamidronate on chronic back pain due to osteoporotic vertebral fractures. *Springer* [Internet]. [cited 2022 Jan 26]; Available from: <https://link.springer.com/content/pdf/10.1007/s100670050099.pdf>
58. Rheumatology AA-, 2000 undefined. Use of pamidronate for acute pain relief following osteoporotic vertebral fractures. *academic.oup.com* [Internet]. [cited 2022 Jan 26]; Available from: <https://academic.oup.com/rheumatology/article-abstract/39/5/567/1784270>
59. Tetsunaga T, Tetsunaga T, Nishida K, Tanaka M, Sugimoto Y, Takigawa T, et al. Denosumab and alendronate treatment in patients with back pain due to fresh osteoporotic vertebral fractures. *Journal of Orthopaedic Science*. 2017 Mar 1;22(2):230–6.
60. Moretti A, de Sire A, Curci C, Toro G, Gimigliano F, Iolascon G. Effectiveness of denosumab on back pain-related disability and quality-of-life in patients with vertebral fragility fractures. *Current Medical Research and Opinion*. 2019 Jan 2;35(1):151–5.
61. Akhter S, Qureshi A, El-Khechen H, reports AB-B, 2020 undefined. The efficacy of teriparatide on lumbar spine bone mineral density, vertebral fracture incidence and pain in post-menopausal osteoporotic patients: A systematic review. *Elsevier* [Internet]. [cited 2022 Jan 26]; Available from: <https://www.sciencedirect.com/science/article/pii/S2352187220304885>
62. Kong M, Zhou C, Zhu K, Zhang Y, aging MS-... interventions in, 2019 undefined. 12-month teriparatide treatment reduces new vertebral compression fractures incidence and back pain and improves quality of life after percutaneous. *ncbi.nlm.nih.gov* [Internet]. [cited 2022 Jan 26]; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/pmc6778479/>

63. Chen L, Vo T, Seefeld L, Malarick C, ... MH-TJ of, 2013 undefined. Lack of correlation between opioid dose adjustment and pain score change in a group of chronic pain patients. Elsevier [Internet]. [cited 2022 Jan 26]; Available from: <https://www.sciencedirect.com/science/article/pii/S1526590012009856>
64. Nevitt MC, Chen P, Kiel DP, Reginster J-Y, Dore RK, Zanchetta JR, et al. Reduction in the risk of developing back pain persists at least 30 months after discontinuation of teriparatide treatment: a meta-analysis. Springer [Internet]. 2006 Nov [cited 2022 Jan 26];17(11):1630–7. Available from: <https://link.springer.com/article/10.1007/s00198-006-0177-z>
65. Neer RM, Arnaud CD, Zanchetta JR, Prince R, Gaich GA, Reginster J-Y, et al. Effect of Parathyroid Hormone (1–34) on Fractures and Bone Mineral Density in Postmenopausal Women with Osteoporosis. *New England Journal of Medicine*. 2001 May 10;344(19):1434–41.
66. Ebeling PR, Akesson K, Bauer DC, Buchbinder R, Eastell R, Fink HA, et al. The Efficacy and Safety of Vertebral Augmentation: A Second ASBMR Task Force Report. *Journal of Bone and Mineral Research* [Internet]. 2019 Jan 1 [cited 2022 Feb 21];34(1):3–21. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/jbmr.3653>
67. Scottish Intercollegiate Guidelines Network (SIGN), Healthcare Improvement Scotland. Management of osteoporosis and the prevention of fragility fractures – A national clinical guideline [Internet]. 2020 [cited 2022 Jan 14]. Available from: <https://www.sign.ac.uk/media/1741/sign142.pdf>
68. National Institute for Health and Care Excellence (NICE). Percutaneous vertebroplasty and percutaneous balloon kyphoplasty for treating osteoporotic vertebral compression fractures [Internet]. 2013 [cited 2022 Feb 16]. Available from: www.nice.org.uk/guidance/ta279
69. Giangregorio LM, McGill S, Wark JD, Laprade J, Heinonen A, Ashe MC, et al. Too Fit To Fracture: outcomes of a Delphi consensus process on physical activity and exercise recommendations for adults with osteoporosis with or without vertebral fractures. *Osteoporos Int* [Internet]. 2015 Feb 18 [cited 2022 Jan 6];26(3):891–910. Available from: <https://pubmed.ncbi.nlm.nih.gov/25510579/>
70. Royal Osteoporosis Society (ROS). Strong, Steady and Straight An Expert Consensus Statement on Physical Activity and Exercise for Osteoporosis. 2018.
71. Gibbs JC, McArthur C, Wark JD, Thabane L, Scherer SC, Prasad S, et al. The Effects of Home Exercise in Older Women With Vertebral Fractures: A Pilot Randomized Controlled Trial. *Phys Ther* [Internet]. 2020 Apr 17 [cited 2022 Jan 6];100(4):662–76. Available from: <https://pubmed.ncbi.nlm.nih.gov/31899499/>
72. Gibbs JC, Macintyre NJ, Ponzano M, Templeton JA, Thabane L, Papaioannou A, et al. Exercise for improving outcomes after osteoporotic vertebral fracture. *Cochrane Database of Systematic Reviews*. 2019 Jul 5;2019(7).
73. Sherrington C, Fairhall N, ... GW-C database, 2019 undefined. Exercise for preventing falls in older people living in the community. *cochranelibrary.com* [Internet]. [cited 2022 Jan 7]; Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD012424.pub2/abstract>
74. Sinaki M. Exercise for Patients with Established Osteoporosis. Non-Pharmacological Management of Osteoporosis: Exercise, Nutrition, Fall and Fracture Prevention [Internet]. 2017 Jun 6 [cited 2022 Feb 18];75–96. Available from: https://link.springer.com/chapter/10.1007/978-3-319-54016-0_7
75. Sinaki M. Exercise for Patients With Osteoporosis: Management of Vertebral Compression Fractures and Trunk Strengthening f... Cite this paper. 2012 [cited 2022 Feb 18]; Available from: <http://dx.doi.org/10.1016/j.pmrj.2012.10.008>
76. Katzman WB, Vittinghoff E, Kado DM. Age-related hyperkyphosis, independent of spinal osteoporosis, is associated with impaired mobility in older community-dwelling women. *Osteoporosis International* [Internet]. 2011 Jan 18 [cited 2022 Jan 6];22(1):85–90. Available from: <https://link.springer.com/article/10.1007/s00198-010-1265-7>
77. Polverino F, de Torres JP, Santoriello C, Capuozzo A, Mauro I, Rojas-Quintero J, et al. Gas exchange and breathing pattern in women with postmenopausal bone fragility. *Respiratory Medicine*. 2018 Apr 1;137:141–6.
78. Leech JA, Dulberg C, Kellie S, Pattee L, Gay J. Relationship of Lung Function to Severity of Osteoporosis in Women. <https://doi.org/10.1164/ajrccm/141168>. 2012 Dec 17;141(1):68–71.
79. Iyer S, Christiansen BA, Roberts BJ, Valentine MJ, Manoharan RK, Boussein ML. A biomechanical model for estimating loads on thoracic and lumbar vertebrae. *Clinical Biomechanics (Bristol, Avon)* [Internet]. 2010 Jul 23 [cited 2022 Jan 6];25(9):853–8. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC20655634/?tool=EBI>
80. Kado DM, Miller-Martinez D, Lui LY, Cawthon P, Katzman WB, Hillier TA, et al. Hyperkyphosis, Kyphosis Progression, and Risk of Non-Spine Fractures in Older Community Dwelling Women: The Study of Osteoporotic Fractures (SOF). *Journal of Bone and Mineral Research* [Internet]. 2014 Oct 1 [cited 2022 Jan 6];29(10):2210–6. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/jbmr.2251>
81. Siminoski K, Jiang G, Adachi JD, Hanley DA, Cline G, Ioannidis G, et al. Accuracy of height loss during prospective monitoring for detection of incident vertebral fractures. *Osteoporosis International*. 2005 Apr;16(4):403–10.
82. Siminoski K, Warshawski RS, Jen H, Lee K. The accuracy of historical height loss for the detection of vertebral fractures in postmenopausal women. *Osteoporosis International*. 2006 Feb;17(2):290–6.

83. Ponzano M, Tibert N, Bansal S, Katzman W, Giangregorio L. Exercise for improving age-related hyperkyphosis: a systematic review and meta-analysis with GRADE assessment. *Archives of Osteoporosis* 2021 16:1 [Internet]. 2021 Sep 21 [cited 2022 Jan 6];16(1):1–14. Available from: <https://link.springer.com/article/10.1007/s11657-021-00998-3>
84. Drew S, Clark E, Al-Sari U, Moore A, Goberman-Hill R. Neglected bodily senses in women living with vertebral fracture: a focus group study.
85. Canada MS-J of O and G, 2009 undefined. Prevalence of urinary incontinence in women with osteoporosis. Elsevier [Internet]. [cited 2022 Jan 7]; Available from: <https://www.sciencedirect.com/science/article/pii/S1701216316341743>
86. Sran MM. Prevalence of Urinary Incontinence in Women With Osteoporosis. *J Obstet Gynaecol Can.* 2009;31(5):434–9.
87. Hallberg I, Ek AC, Toss G, Bachrach-Lindström M. A striving for independence: a qualitative study of women living with vertebral fracture. *BMC Nursing* [Internet]. 2010 Apr 16 [cited 2022 Jan 6];9:7–7. Available from: <http://www.biomedcentral.com/1472-6955/9/7>
88. Ziebart C, McArthur C, Lee L, Papaioannou A, Laprade J, Cheung AM, et al. “Left to my own devices, I don’t know”: using theory and patient-reported barriers to move from physical activity recommendations to practice. *Osteoporosis International.* 2018 May 1;29(5):1081–91.
89. Ponzano M, Gibbs JC, Adachi JD, Ashe MC, Cheung AM, Hill KD, et al. Exploring Fear of Falling and Exercise Self-Efficacy in Older Women With Vertebral Fractures. *Journal of Aging and Physical Activity* [Internet]. 2020 Aug 19 [cited 2022 Jan 6];29(2):219–24. Available from: <https://journals.humankinetics.com/view/journals/japa/29/2/article-p219.xml>
90. Svensson HK, Olofsson EH, Karlsson J, Hansson T, Olsson L-E. A painful, never ending story: older women’s experiences of living with an osteoporotic vertebral compression fracture. Springer [Internet]. [cited 2022 Jan 7]; Available from: <https://link.springer.com/content/pdf/10.1007/s00198-015-3445-y.pdf>
91. Dewan N, MacDermid JC. Fall Efficacy Scale – International (FES-I). *Journal of Physiotherapy.* 2014 Mar 1;60(1):60.
92. NHS England » Adult Improving Access to Psychological Therapies programme [Internet]. [cited 2022 Mar 16]. Available from: <https://www.england.nhs.uk/mental-health/adults/iapt/>
93. Katzman WB, Harrison SL, Fink HA, Marshall LM, Orwoll E, Barrett-Connor E, et al. Physical Function in Older Men With Hyperkyphosis. *The Journals of Gerontology: Series A* [Internet]. 2015 May 1 [cited 2022 Jan 6];70(5):635–40. Available from: <https://academic.oup.com/biomedgerontology/article/70/5/635/647336>
94. Ziebart C, Gibbs JC, McArthur C, Papaioannou A, Mittmann N, Laprade J, et al. Are osteoporotic vertebral fractures or forward head posture associated with performance-based measures of balance and mobility? *Archives of Osteoporosis.* 2019 Dec 1;14(1).
95. Drootin M. Summary of the Updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. *J Am Geriatr Soc* [Internet]. 2011 Jan [cited 2022 Jan 6];59(1):148–57. Available from: <https://pubmed.ncbi.nlm.nih.gov/21226685/>
96. Sibley KM, Howe T, Lamb SE, Lord SR, Maki BE, Rose DJ, et al. Recommendations for a core outcome set for measuring Standing balance in adult populations: A consensus-based approach. *PLoS ONE.* 2015 Mar 13;10(3).
97. National Institute for Health and Care Excellence (NICE). Osteoporosis: assessing the risk of fragility fracture Clinical guideline [CG146] [Internet]. 2012 Aug [cited 2022 Jan 6]. Available from: <https://www.nice.org.uk/guidance/cg146>
98. National Institute for Health and Care Excellence (NICE). Bisphosphonates for treating osteoporosis Technology appraisal guidance [TA464] [Internet]. 2019 [cited 2022 Jan 17]. Available from: <https://www.nice.org.uk/guidance/ta464>
99. National Osteoporosis Guideline Group (NOGG). Clinical guideline for the prevention and treatment of osteoporosis [Internet]. 2019 [cited 2022 Jan 17]. Available from: <https://www.sheffield.ac.uk/NOGG/NOGG%20Guideline%202017%20July%202019%20Final%20Update%20290719.pdf>
100. Compston J, Cooper A, Cooper C, Gittoes N, Gregson C, Harvey N, et al. UK clinical guideline for the prevention and treatment of osteoporosis. *Archives of Osteoporosis* 2017 12:1 [Internet]. 2017 Apr 19 [cited 2022 Jan 17];12(1):1–24. Available from: <https://link.springer.com/article/10.1007/s11657-017-0324-5>
101. Sinaki M. Exercise for patients with osteoporosis: Management of vertebral compression fractures and trunk strengthening for fall prevention. *PM and R.* 2012 Nov;4(11):882–8.
102. Katzman WB, Vittinghoff E, Kado DM, Schafer AL, Wong SS, Gladin A, et al. Study of Hyperkyphosis, Exercise and Function (SHEAF) Protocol of a Randomized Controlled Trial of Multimodal Spine-Strengthening Exercise in Older Adults With Hyperkyphosis. *Physical Therapy* [Internet]. 2016 Mar 1 [cited 2022 Jan 14];96(3):371. Available from: <https://pubmed.ncbi.nlm.nih.gov/267477438/>
103. Devereux K, Robertson D, Briffa NK. Effects of a water-based program on women 65 years and over: A randomised controlled trial. *Australian Journal of Physiotherapy.* 2005 Jan 1;51(2):102–8.
104. Royal College of Physicians. FLS Database [Internet]. [cited 2022 Feb 18]. Available from: <https://www.ffap.org.uk/fls/flsweb.nsf>



About us

The Royal Osteoporosis Society is the only UK-wide charity dedicated to ending the pain and suffering caused by osteoporosis. The Charity works tirelessly to help and support people with the condition as well as promoting good bone health to prevent osteoporosis. We do this by:

- Providing a range of information resources covering all aspects of osteoporosis for health professionals and the public.
- Providing a free helpline staffed by nurses with specialist knowledge of osteoporosis and bone health.
- Investing in research to ensure future generations are freed from the burden of osteoporosis.
- Influencing government and campaigning to improve and maintain essential services.
- Educating Health Professionals to ensure they are kept up to date about osteoporosis – through events, accredited training courses and our leading conference on osteoporosis and bone health.
- Working in partnership with the NHS to set up and improve Fracture Liaison Services which can reduce the number of fractures caused by osteoporosis.

To find out more about our information, support and services, visit our website: theros.org.uk

Professional Membership

Professional membership of the Royal Osteoporosis Society will ensure you become better informed and able to deliver the best care possible to people with osteoporosis or fractures.

As a professional member, you'll have all the information you need at your fingertips and will stay up to date on best practice, care, delivery, new treatments and the latest news on osteoporosis research findings.

You'll also feel proud to be part of an organisation working hard to help those affected by osteoporosis.

To join a growing network of professional members like you, call our membership team on **01761 473287 or visit theros.org.uk/healthcare-professionals**



@RoyalOsteoPro



01761 471771 (General Enquiries)



0808 800 0035 (Specialist Nurse Helpline)



theros.org.uk



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President: HRH The Duchess of Cornwall

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Published April 2022