

TOPIC 7



HEALTH QUALITY & SAFETY
COMMISSION NEW ZEALAND
Kupu Taurangi Hauora o Aotearoa

Why hip fracture prevention and care matter

How you can use Topic 7	1
Key messages in Topic 7	2
What Topic 7 covers	2
What is the burden of hip fracture?	3
How osteoporosis develops and progresses	3
How we can prevent fragility fractures	5
Why calcium should not be prescribed to reduce harm from falls	6
60 minutes of professional development	9
Recommended reading	10
Recommended resources and websites	10
Professional development: questions to test your knowledge	11
References	12

How you can use **Topic 7**

Use Topic 7 as:

- an information resource that explains the evidence and rationale for identifying and managing osteoporosis and the prevention and care of hip fractures
- a 60-minute professional development exercise (see [60 minutes of professional development](#) in this resource).

**LIVE STRONGER
FOR LONGER**

PREVENT FALLS & FRACTURES

newzealand.govt.nz



Key messages in Topic 7

- Hip fractures matter because, quite literally, they change the lives of those who suffer them forever. Hip fractures also place significant demands on health and social care services and a financial burden on families/whānau, and consume considerable financial resources that are, and increasingly will be, needed elsewhere. Preventing falls also prevents hip fractures.
- Hip fractures are most likely to happen to the most vulnerable in our society. Crucially, half of these people provide us with advance notice by breaking another bone before they break their hip.
- Osteoporosis is a long-term condition that is a primary cause of fragility fractures, when combined with a propensity to fall. However, evidence-based identification and management of osteoporosis helps to reduce the risk of fractures.
- Keys to preventing fragility fractures are screening for osteoporosis risk factors, treating osteoporosis, developing a falls prevention care plan for the individual older person at risk of falling and fracturing a bone, and referring to a fracture liaison service any person who has suffered a fragility fracture.
- Anyone providing hip fracture care should deliver care in accordance with the [Clinical Care Standard](#) and the [Australian and New Zealand Hip Fracture Registry's Standards and Guidelines for Hip Fracture Care](#). An assessment by an orthogeriatrician is an important part of that care process.
- Osteoporosis New Zealand and the International Osteoporosis Foundation note there are many gaps in optimal bone care, and we can all help to coordinate the delivery of primary and secondary fracture prevention, as well as evidence-based fracture care.



What Topic 7 covers

It's hard to imagine a family in New Zealand not affected by the impact of a loved one suffering from a hip fracture – nearly everyone has an elderly relative, neighbour or friend who has broken their hip after a fall. Loss of independence and poor recovery, and even death, are such common outcomes that hip fracture is understood as a significant and devastating event in an older person's life.

Topic 7 explains how to reduce the risk of falls-related fracture by treating osteoporosis and how to predict an older person's risk of hip fracture. These actions, along with using intervention strategies to modify or eliminate the risks, can help reduce the burden of hip fractures. We'll see also that improvements in care for patients with a hip fracture can prevent avoidable complications that compromise recovery. The required reading includes [a study on the messages older people found enabling in their recovery after a hip fracture](#) (Schiller et al 2015).

The significance of hip fracture requires a system-wide approach. Another required reading includes an [overview of four objectives for improvements in hip fracture prevention and care](#). Those objectives integrate population health, and primary and secondary care approaches and services.



What is the burden of hip fracture?

Hip fractures matter because, quite literally, they frequently change the lives of those who suffer them forever. The impact on individuals – and their families/whānau – can be catastrophic.

The Australian and New Zealand Hip Fracture Registry (ANZHFR) tells us that in 2018:

- hip fracture was the most serious and costly fall-related injury suffered by older people. More than 25,000 people across Australia and New Zealand break their hip each year, with the cost to the economy approximately \$1 billion annually
- 79 percent of those who fractured their hip did not return to pre-fracture mobility at 120 days
- 21 percent did not return to their own home at 120 days
- 10 percent of those who fractured their hip died within 120 days.

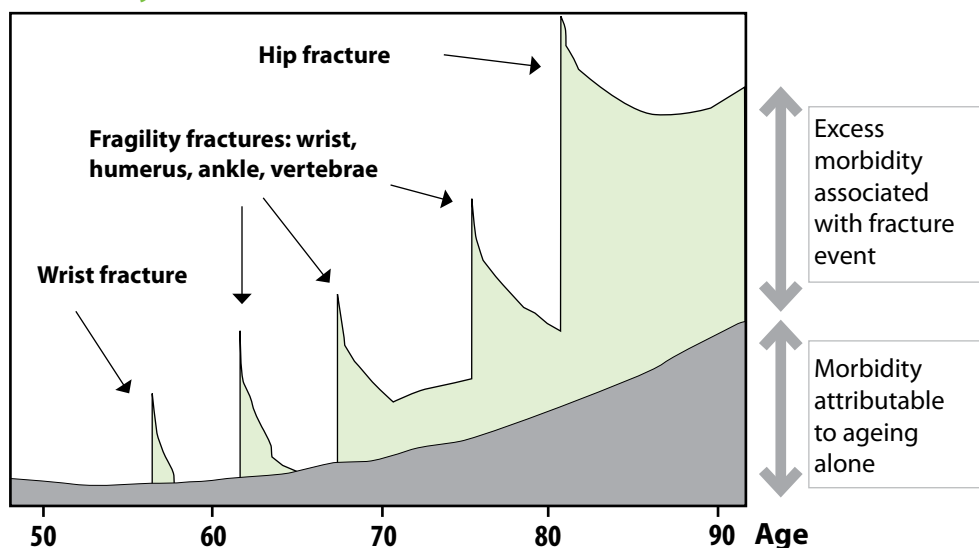
Hip fractures place significant demands on health and social care systems, and consume considerable financial resources that are, and increasingly will be, needed elsewhere. This is why a major, system-wide approach to hip fracture prevention and care is necessary. The combined effect of the [Health Quality & Safety Commission's reducing harm from falls](#) programme, new [Osteoporosis New Zealand guidance on identifying and managing osteoporosis](#), the development of an [Australian and New Zealand Hip Fracture Registry](#) and the Hip Fracture Registry's [Guidelines and Standards for Hip Fracture Care](#) are intended to manage this burden over time. ♦



How osteoporosis develops and progresses

Hip fracture has been described as '... all too often the final destination of a 30-year journey fuelled by decreasing bone strength and increasing falls risk' (Mitchell 2009). This 'journey' of fracture experience through the lifecycle – also referred to as the 'osteoporotic career' – is illustrated below (British Orthopaedic Association 2007).

Morbidity



Adapted from Kanis JA, Johnell O. 1999. The burden of osteoporosis. *Journal of Endocrinological Investigation* 22(8): 583–588

HOW OSTEOPOROSIS DEVELOPS AND PROGRESSES *Continued*

Osteoporosis is a long-term condition that is a primary cause of fragility fractures, when combined with a propensity to fall. Some have defined fragility fractures as fractures in an older person that we would not expect to see in a healthy young person who experienced the same type of incident (Eisman et al 2012). Preventing falls is the core of fracture prevention. Managing bone fragility is the key to reducing harm from falls.

As well as keeping a healthy body weight of BMI above 20, doing regular weight-bearing exercises, and not smoking, having adequate dietary intake of calcium and circulating levels of vitamin D throughout life are essential for good bone health. As we age, bones deteriorate faster than they form. The resulting bone loss increases the risk of osteoporosis.

Except for fractures of the vertebrae attributable to osteoporosis, the majority of fragility fractures occur because the older person has fallen from standing height. Since epidemiological studies suggest the bulk of fragility fractures occur among people aged 50 years and older, fractures in this age group should be considered osteoporotic until ruled out (Eisman et al 2012).

People who suffer a first fragility fracture are at double the risk of future fractures compared with people who have never broken a bone (Kanis et al 2004). Since the 1980s we have known that at least half of the people who break their hip have already suffered a fragility fracture (Gallagher et al 1980; Port et al 2003). It's estimated that one-sixth of postmenopausal women have suffered a fragility fracture at any skeletal site (Marsh et al 2011) (compared with an estimated 6 percent of men). Taken together, the data suggests that half of all hip fractures will emanate from the small subgroup of the population who have already suffered a fragility fracture. ♦



How we can prevent fragility fractures

Prevention of fragility fractures starts with the basics of building and maintaining bone density through a [healthy diet](#) and [weight-bearing exercise](#). Since the majority of fragility fractures are related to a fall, preventing falls is important. Conversely, older people who have recurrent falls should be targeted to assess for osteoporosis and risk of fractures. Specific strategies for preventing falls in hospital, residential and home care settings, and the general older population are discussed in the [10 Topics: screening for falls risk, multifactorial assessment and intervention, safe environments and safe care](#) and [improving strength and balance](#).

Assessing older people's osteoporosis risk includes identifying those who will benefit from related interventions to reduce future fracture risk.

Osteoporosis New Zealand has published [guidance on how to diagnose and manage osteoporosis](#). This guidance emphasises the importance of pharmacologic intervention for older people who have risk factors for osteoporosis or fractures that do not involve major trauma, and who are assessed by bone mineral density scan (DXA) or a [fracture risk assessment score](#) (FRAX®/Garvan) as being at high risk for fractures. Treatment can be started without bone mineral density screening in those over 75 years who have had a minimal trauma fracture.

The mainstay of current therapy for osteoporosis is the [bisphosphonate](#) class of drugs along with weight-bearing exercise and high dietary calcium.

Bisphosphonates (currently funded by PHARMAC) include weekly oral tablets alendronic acid/alendronate (Fosamax®) or risedronate sodium (Risedronate Sandoz®); or yearly infusions of zoledronic acid (Aclasta®). Bisphosphonates have been shown to reduce the incidence of fragility fractures by 30–50 percent (Crandall et al 2014; Kanis et al 2013), including hip fractures, and even for people with a history of multiple fractures (Ensrud et al 1997). Evidence suggests that treating osteoporosis reduces deaths (Center et al 2011). Cognitive impairment should not be seen as a barrier to treatment, and bisphosphonates are effective in this group (Prieto-Alhambra et al 2014). It's important to use clinical judgement to optimise the level of care of people with multiple comorbidities, where [polypharmacy](#) is a constant challenge. [bpac^{nz}](#) provides updated information (2019) on the use of bisphosphonates [here](#).

There is wide variation between hospitals in the use of bisphosphonates to promote bone health and prevent and treat osteoporosis in people aged 50 and over following hip fracture, with the proportion of those who have fractured their hip taking bisphosphonates at discharge ranging from less than 10 percent in some New Zealand hospitals to nearly 50 percent in others (ANZHFR 2019). This variation suggests an opportunity for staff to learn more about prescribing bisphosphonates for osteoporosis treatment.

A [Cochrane review of the role of hip protectors in preventing hip fractures](#) concluded that hip protectors reduce the rate of hip fractures if frail older people in nursing care have access to them (Santesso et al 2014). The key challenges are getting the older person to accept and wear them, and getting both the older person and their carers to see the benefit (Crandall et al 2016). ♦



Why cognitive impairment and other comorbidities are important

The prevalence of comorbid conditions, particularly cognitive impairment, is high among people who fracture their hips. In 2007, the Scottish Hip Fracture Audit reported that 28 percent of patients had a previous diagnosis of cognitive impairment (NHS National Services Scotland 2007). Auckland City Hospital's orthogeriatric service identified cognitive impairment among 43 percent of hip fracture patients (Fergus et al 2011). Cardiac and respiratory comorbidities were also common, being present in 43 percent and 20 percent of patients respectively. The ANZHFR Annual Report indicates that 40 percent of those who fracture their hip in New Zealand have cognitive impairment (ANZHFR 2019).

We know that people with cognitive impairment have poorer outcomes after fracturing their hip, but also that rehabilitation interventions can improve these outcomes in many individuals with cognitive impairment. This evidence underpins recommendations that all patients with a hip fracture have orthogeriatric and physiotherapy assessment as part of their care in order to devise appropriate rehabilitation (Neuburger et al 2016).

Important approaches to care for those with cognitive impairment include a close care with dignity approach that is based on an understanding of dementia, then need to adapt communication style to this older person, involving carers to support rehabilitation activities, understanding any impulsive behaviour of this patient, and empowering observers to assist with a focus on ambulation and supporting independence (Grealish et al 2018). Further details on approaches to care to reduce harm from falls for those with cognitive impairment can be read here.

What strategies improve hip fracture prevention and care?

In December 2012, Osteoporosis New Zealand published BoneCare 2020: A systematic approach to hip fracture care and prevention for New Zealand. Four key objectives were proposed for specific groups. Many of these messages are reiterated in the International Osteoporosis Foundation's 2016 World Osteoporosis Day Report. Fracture liaison service clinical standards in conjunction with evidence-based clinical pathways can help to ensure care occurs in an evidence-based way.

1. **Hip fracture patients:** the multidisciplinary hospital team should improve outcomes and quality of care after hip fractures by delivering care according to professionally defined standards.
2. **Non-hip fragility fracture patients:** hospitals and GPs should always respond to the first fracture to prevent a second fracture. They should also ensure that assessing and treating osteoporosis occurs as appropriate, and that interventions to reduce falls risk are delivered as part of fracture care.
3. **Individuals at high risk of first fragility fracture or other injurious fall:** GPs are ideally placed to stratify future fracture risk (see next section).
4. **All older people:** a system-wide effort should be developed to deliver consistent public health messages on physical activity, healthy lifestyles and reducing environmental hazards.

Identify older people at risk of fractures

A large number of older people are likely to benefit from fracture prevention strategies so 'case-finding' activities are important. Primary health care teams should ask older people about falls to identify those at risk of falling and most likely to benefit from a falls risk assessment and appropriate interventions. GPs are ideally placed to stratify future fracture risk by using online fracture risk calculators (FRAX®/Garvan) to determine which people should be offered osteoporosis treatment. A randomised controlled trial in the UK compared a screening programme using the FRAX tool with usual care. Of 6,233 women randomised to the screening group, 898 women were identified for treatment with osteoporosis medication. Over a five-year period, those in this intervention sub-group had 28 percent fewer hip fractures (Shepstone et al 2018).

Fracture liaison services

Only a minority of fragility fracture sufferers currently receive the secondary preventive care they need (Harvey and McCloskey 2016; ANZHFR 2019; Braatvedt et al 2017). Yet people who suffer fractures are at double the risk of suffering subsequent fractures compared with their peers who are fracture-free. Also, half of all individuals who suffer hip fractures break another bone before breaking their hip. So it's obvious that New Zealand cannot afford to continue this gap in secondary preventive care.

In response, Osteoporosis New Zealand has worked with the Ministry of Health, Health Quality & Safety Commission, the Accident Compensation Corporation and other key stakeholders to steer all district health boards (DHBs) to implement fracture liaison services (FLS). In December 2014, Osteoporosis New Zealand published an [FLS Resource Pack](#), with the intention of supporting those DHBs yet to implement an FLS. This is in line with the requirement of the 2014–15 district annual planning guidance from the Ministry of Health.

An FLS systematically identifies people who have fragility fractures. The intention is to prevent later fractures. The services offer these people an assessment for bone health (for osteoporosis) and the risks of falling and future fractures. Indeed, such a service appears to decrease mortality (Mitchell et al 2016). Successful FLS have multidisciplinary involvement, a dedicated case manager, regular assessment and follow-up, multifaceted interventions and consumer education. Furthermore, FLS programmes led by orthopaedic surgeons had higher rates of bone mineral density testing. FLS are associated with a 27 percent increase in the likelihood of bone mineral density testing and up to 21 percent increase in the likelihood of treatment initiation compared with usual care (Wu et al 2018). [Clinical standards for FLS in New Zealand](#) are available.

The intent of an FLS is to develop a long-term plan for reducing risk of falls and fractures in conjunction with the individual and their GP. Topic 4 explains many aspects of [a care plan tailored to each person](#) at risk of falling.

DHBs providing their own FLS may end up with slight variations in the target population. Even so, any person with an age-related, low-impact (or non-traumatic) fracture involving the proximal femur, wrist, humerus, vertebrae or pelvis should be considered an appropriate person for an FLS nurse assessment.

Hip fracture care guidelines

The [Australian and New Zealand Guideline for Hip Fracture Care](#) is designed to help professionals who provide hip fracture care to deliver that care consistently, effectively and efficiently. The ultimate goal is to give every older person with a hip fracture the best chance of recovery.

The purpose of the guideline is to provide clear, concise, evidence-based recommendations on a number of aspects of hip fracture care that, if applied, are likely to lead to improved outcomes for the patient as well as delivering cost-effective care. The guideline is adapted from the NICE clinical guideline [The Management of Hip Fracture in Adults](#), and modified for the Australian and New Zealand context.

The guideline, which is endorsed by the Health Quality & Safety Commission, is the basis for measurable [standards of care for hip fracture patients](#), published by the Australian and New Zealand Hip Fracture Registry.

Hip fracture registries

There is an [Australian and New Zealand Hip Fracture Registry](#). You can read the registry's annual reports [here](#). You can find contact details for the national registry coordinator [here](#).

Implementing what works

Data from the ANZHFR indicates that in some cases we are not yet implementing simple measures that guidance recommends. For example:

- only 35 percent of hip fracture patients in New Zealand had an assessment of cognitive function prior to surgery (ANZHFR 2019). However, we know that cognitive impairment is a key risk factor for falls and a baseline cognitive assessment is important in later diagnosis of delirium

- only 30 percent of hip fracture patients in New Zealand were assessed by a geriatrician before surgery (ANZHFR 2019). However, we know that orthogeriatric models of care improve outcomes for hip fracture patients (Eamer et al 2018) and decrease mortality by up to 38 percent (Moyet et al 2019).
- only 26 percent of hip fracture patients were on active treatment for osteoporosis when discharged from the operating hospital (ANZHFR 2019). However, New Zealand guidance recommends all patients are offered bone preserving treatment without delay (Osteoporosis New Zealand 2017), and a diagnosis of osteoporosis may be assigned to those who have had a hip fracture, no matter whether bone mineral density testing has been performed or not (Siris et al 2014)
- even when older people are prescribed bone-preserving treatment, adherence cannot be assumed and follow-up is important. A 2016 UK FLS clinical audit reported that only 14 percent of people confirmed adherence to their medication at 12 months (NICE 2018). This finding emphasises the importance of follow-up to support people with the appropriate interventions. Key messages could perhaps be distributed at community strength and balance classes.

How you can help prevent hip fractures

Reducing the human and economic impact of hip fractures in New Zealand requires a system-wide approach. Hip fractures are most likely to happen to the most vulnerable in our society. Crucially, half of these people provide us with advance notice by breaking another bone before they break their hip.

The International Osteoporosis Foundation identified nine **gaps in bone care** (Harvey and McCloskey 2016):

- Gap 1: Secondary fracture prevention
- Gap 2: Osteoporosis induced by medicines
- Gap 3: Diseases associated with osteoporosis
- Gap 4: Primary fracture prevention for individuals at high risk of fracture
- Gap 5: The importance of staying on treatment
- Gap 6: Public awareness of osteoporosis and fracture risk
- Gap 7: Public awareness of the benefits versus the risks of osteoporosis treatment
- Gap 8: Access and reimbursement for osteoporosis assessment and treatment
- Gap 9: Prioritisation of fragility fracture prevention in national policy.

What is your part – and your team's or service's part – in this mission? ◆



60 MINUTES OF PROFESSIONAL DEVELOPMENT

This learning activity equals 60 minutes of your professional development.

You can add it to the personal professional record you keep to check off your competence framework requirements.

To complete this learning activity, first read the whole topic and the three required readings, then assess your learning with the **10 self-test questions**.

Learning objectives

Reading and reflecting on Topic 7 and the materials in this teaching and learning package will enable you to:

- review the impacts of hip fracture at individual, system and population levels
- outline the relationship between osteoporosis, falls and fractures
- describe gaps identified in recognising and assessing the risk of falls and fractures
- relate strategies for improving services for hip fracture prevention and care in New Zealand to your own role, team and service.

Teaching and learning package

Gather up the resources you'll need. Use the hyperlinks in this topic, or download or print the reference material.

Required reading

These three readings will help you form evidence-informed perspectives about why hip fracture prevention and care matter.

1. Schiller C, Franke T, Belle J, et al. 2015. Words of wisdom – patient perspectives to guide recovery for older adults after hip fracture: a qualitative study. *Patient Preference and Adherence* 9: 57–64. [Available here](#).
2. Osteoporosis New Zealand. 2017. [Guidance on the Diagnosis and Management of Osteoporosis in New Zealand](#). Wellington: Osteoporosis New Zealand.
3. [Strategies to improve hip fracture prevention and care](#) (Topic 7 supplement).

RECOMMENDED READING

Information for consumers is available on the [Osteoporosis New Zealand website](#).

Discussion on clinical diagnosis of osteoporosis: Siris ES, Boonen S, Mitchell PJ, et al. 2012. What's in a name? What constitutes the clinical diagnosis of osteoporosis? *Osteoporosis International* 23(8): 2093–7. [Abstract and preview](#).

RECOMMENDED RESOURCES AND WEBSITES

[Australia and New Zealand Hip Fracture Registry](#), and its [Annual Reports](#).

Osteoporosis New Zealand. 2017. [Guidance on the Diagnosis and Management of Osteoporosis in New Zealand](#). Wellington: Osteoporosis New Zealand.

New Zealand [Fracture Liaison Service Clinical Standards](#).

[WHO Fracture risk assessment tool FRAX®](#).

[Garvan fracture risk calculator](#).

Osteoporosis New Zealand: [Bone Health New Zealand, IOF Compendium 2nd edition 2019, Bisphosphonates: addressing the duration conundrum](#).

[NICE Hip Fracture Management Clinical Guideline](#).

Hip fracture care [clinician](#) and [consumer](#) fact sheets.

10 QUESTIONS

TOPIC 7 Professional development: questions to test your knowledge



PROFESSIONAL DEVELOPMENT ACTIVITY

ANSWER these questions to check you have retained the knowledge reviewed in this topic and readings

1	Overall, the material presented in Topic 7 and the required readings suggest that: given trends in the improved health of older people, rates of fragility fracture will decrease given trends in increasing longevity and comorbidities, rates of fragility fracture will increase
2	The required reading 'Words of wisdom – patient perspective to guide recovery for older adults after hip fracture: a qualitative study' reports that the older people studied advised these messages would enable their recovery: don't be dependent on others, expect to recover quickly seek support, preserve perspective and increase independence
3	The required reading <u>Guidance on the Diagnosis and Management of Osteoporosis in New Zealand</u> states that to preserve bone health throughout life, we should encourage patients to: have adequate sun exposure stop smoking eat a balanced diet perform regular weight-bearing exercise all of the above
4	The required reading 'Strategies to improve hip fracture prevention and care' states that retrospective case-finding for secondary prevention: is important because people who had a fracture after the age of 50 may not have received assessment and intervention for osteoporosis is not important for people aged 50–65 as most fractures in this age group do not relate to osteoporosis.
5	Which of these people aged 65 is least likely to have an increased risk of fragility fracture? Mr Brown, who recently fractured his ankle and whose mother fractured her hip at the age of 68. Mrs Jones, who has been in a walking group for the last 40 years and whose weight is normal. Mrs Smith, who had anorexia nervosa in her youth and is still considered very under-weight.

ANSWER

ASSESS the processes used to assess older people to prevent hip fractures in your setting

6	What process is used in your care setting to assess the risk of osteoporosis and fracture in older patients/residents/clients? What would need to change (if anything) to put in place a methodical and consistent approach – such as a fracture liaison service – to assessing all older people for their risk of fracture?
7	Select the step in 'Strategies to improve hip fracture prevention and care' that is most relevant to the older people in your care. Describe three specific things you already do (or could do) to improve the care involved in this step with your patients/residents/clients? 1. 2. 3.

ASSESS

Outline three learnings or insights and how you will APPLY them in your practice

8	My first learning/insight is: I will apply it in practice by:
9	My second learning/insight is: I will apply it in practice by:
10	My third learning/insight is: I will apply it in practice by:

APPLY

LEARNER NAME:	PROFESSION:	DESIGNATION:
DATE:	REGISTRATION ID:	WORKPLACE:

Validation that learner has completed this professional development activity		Signature:
NAME:	PROFESSION:	CONTACT:
DATE:	REGISTRATION ID:	WORKPLACE:

REFERENCES

- ANZHR. 2019. *2019 Annual Report*. Australian and New Zealand Hip Fracture Registry.
- Braatvedt G, Wilkinson S, Scott M, et al. 2017. Fragility fractures at Auckland City Hospital: we can do better. *Arch Osteoporos* 12(1): 64. DOI: 10.1007/s11657-017-0353-0. [Epub 14 July 2017.]
- British Orthopaedic Association. 2007. *The care of patients with fragility fracture*. London: British Geriatrics Society.
- Center JR, Bliuc D, Nguyen ND, et al. 2011. Osteoporosis medication and reduced mortality risk in elderly women and men. *The Journal of Clinical Endocrinology & Metabolism* 96(4): 1006–14.
- Cooper C. 1997. The crippling consequences of fractures and their impact on quality of life. *The American Journal of Medicine* 103(2): S12–S9.
- Crandall C, Newberry S, Diamant A, et al. 2014. Comparative Effectiveness of Pharmacologic Treatments to Prevent Fractures: An Updated Systematic Review. *Annals of Internal Medicine* 161: 711–23.
- Crandall M, Duncan T, Mallat A, et al. 2016. Prevention of fall-related injuries in the elderly: An Eastern Association for the Surgery of Trauma practice management guideline. *Journal of Trauma and Acute Care Surgery* 81(1): 196–206.
- Dyer SM, Crotty M, Fairhall N, et al. 2016. A critical review of the long-term disability outcomes following hip fracture. *BMC Geriatrics* 16: 158.
- Eamer G, Taheri A, Chen S, et al. Comprehensive geriatric assessment for older people admitted to a surgical service. *Cochrane Database Syst Rev* 2018, Issue 1, Art. No. CD012485.
- Eisman JA, Bogoch ER, Dell R, et al. 2012. Making the first fracture the last fracture: ASBMR task force report on secondary fracture prevention. *Journal of Bone and Mineral Research* 27(10): 2039–46.
- Ensrud KE, Black DM, Palermo L, et al. 1997. Treatment With Alendronate Prevents Fractures in Women at Highest Risk: Results From the Fracture Intervention Trial. *Archives of Internal Medicine* 157(22): 2617–24.
- Fergus L, Cutfield G, Harris R. 2011. Auckland City Hospital's ortho-geriatric service: an audit of patients aged over 65 with fractured neck of femur. *The New Zealand Medical Journal (Online)* 124(1337).
- Gallagher J, Melton L, Riggs BL, et al. 1980. Epidemiology of fractures of the proximal femur in Rochester, Minnesota. *Clinical Orthopaedics and Related Research* 150: 163–71.
- Gillespie WJ, Gillespie LD, Parker MJ. 2010. Hip protectors for preventing hip fractures in older people. *The Cochrane Library* 10: CD001255.
- Harvey N, McCloskey E. 2016. *Gaps and Solutions in Bone Health: A Global Framework for Improvement*. Nyon: International Osteoporosis Foundation.
- Kanis J, Johnell O, De Laet C, et al. 2004. A meta-analysis of previous fracture and subsequent fracture risk. *Bone* 35(2): 375–82.
- Kanis J, McCloskey E, Johansson H, et al. 2013. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis International* 24(1): 23–57.
- Marsh D, Åkesson K, Beaton D, et al. 2011. Coordinator-based systems for secondary prevention in fragility fracture patients. *Osteoporosis International* 22(7): 2051–65.
- Mitchell P. 2009. Fracture Liaison Services: A systematic approach to secondary fracture prevention. *Osteoporosis Review* 17(1): 14–16.
- Mitchell P, Åkesson K, Chandran M, et al. 2016. Implementation of Models of Care for secondary osteoporotic fracture prevention and orthogeriatric Models of Care for osteoporotic hip fracture. *Best Practice & Research Clinical Rheumatology* 30(3): 536–58.
- Moyet J, Deschasse G, Marquant B, et al. 2019. Which is the optimal orthogeriatric care model to prevent mortality of elderly subjects post hip fractures? A systematic review and meta-analysis based on current clinical practice. *Int Orthop* 43(6): 1449–54.
- Neuburger J, Currie C, Wakeman R, et al. 2016. Increased orthogeriatric involvement in hip fracture care and its impact on mortality in England. *Age and ageing* 46(2): 187–92.
- New Zealand Health Information Service. 2002. *Fracture of Neck of Femur Services In New Zealand Hospitals 1999/2000*. Wellington: NZHIS/Ministry of Health.
- NHS National Services Scotland. 2007. *Scottish Hip Fracture Audit Rehabilitation Report 2007*. Edinburgh: ISD Scotland Publications: NHS National Services Scotland.
- NICE. 2018. *NICE Impact: Falls and fragility fractures*. London: National Institute for Health and Care Excellence.
- Osteoporosis New Zealand. 2017. *Guidance on the Diagnosis and Management of Osteoporosis in New Zealand*. URL: <https://osteoporosis.org.nz/resources/health-professionals/clinical-guidance/>.
- Port L, Center J, Briffa NK, et al. 2003. Osteoporotic fracture: missed opportunity for intervention. *Osteoporosis International* 14(9): 780–4.
- Prieto-Alhambra D, Judge A, Arden NK, et al. 2014. Fracture prevention in patients with cognitive impairment presenting with a hip fracture: secondary analysis of data from the HORIZON Recurrent Fracture Trial. *Osteoporosis International* 25(1): 77–83. DOI: 10.1007/s00198-013-2420-8.
- Santoso N, Carrasco-Labra A, Brignardello-Petersen R. Hip protectors for preventing hip fractures in older people. *Cochrane Database Syst Rev* 2014, Issue 3, Art. No. CD001255. DOI: 10.1002/14651858.CD001255.pub5.
- Siris ES, Adler R, Bilezikian J, et al. 2014. The clinical diagnosis of osteoporosis: a position statement from the National Bone Health Alliance Working Group. *Osteoporosis International* 25(5): 1439–43. DOI: 10.1007/s00198-014-2655-z.
- Schiller C, Franke T, Belle J, et al. 2015. Words of wisdom – patient perspectives to guide recovery for older adults after hip fracture: a qualitative study. *Patient Preference and Adherence* 9: 57–64.
- Wu CH, Chen CH, Chen PH, et al. 2018. Identifying characteristics of an effective fracture liaison service: systematic literature review. *Osteoporosis International* 29(5): 1023–47. DOI: 10.1007/s00198-017-4370-z.

**LIVE STRONGER
FOR LONGER**

PREVENT FALLS & FRACTURES