Getting patients back on their feet after a hip fracture

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Hip fracture is a potentially devastating condition for older people. Although the initial treatment is surgical repair of the fracture, a long-term multidisciplinary management approach involving the patient's GP is required to maximise recovery and ensure secondary prevention strategies are implemented.

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Each day, more than 40 Australians fracture their hips.[1] Over 90% of them are aged 65 years or over, and more than half are aged 85 years or over.[1] With an ageing population, increasing numbers of older people will experience a hip fracture. Osteoporotic hip fractures place a heavy burden on the affected individuals, their caregivers and the health system.[1] Patients are almost invariably treated surgically unless they have severe comorbidities or are in an advanced palliative stage, in which case they may be managed nonoperatively.[2]

Postoperatively, the path to recovery is long. Out of 100 patients, approximately seven will die within 30 days of the fracture, and four will need to enter a residential aged care facility, either while they recover or permanently.[3] A year later, fewer than half will be able to walk as well as they did before the fracture, and an additional 10 to 15 will have died.[4,5] In the two years after the index hip fracture, one in five patients will experience another fracture.[6]

The outcome that is most important to many older people with hip fracture is a future with functional independence and good quality of life. An opportunity exists to improve the health outcomes of these patients through closer attention to their postdischarge needs and better implementation of evidence-based care.

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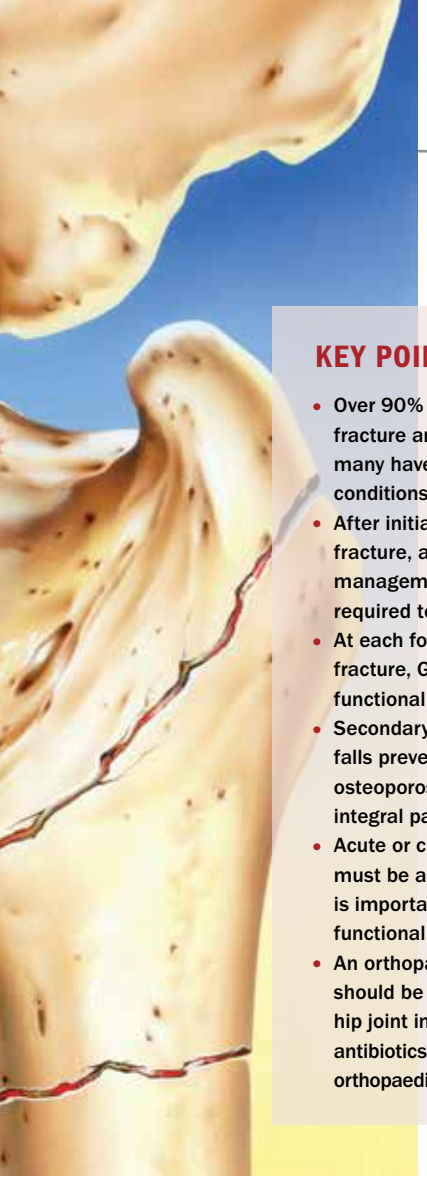


KEY POINTS

- Over 90% of patients who sustain a hip fracture are older than 65 years and many have multiple coexisting medical conditions.
- After initial surgical repair of a hip fracture, a long-term multidisciplinary management approach involving GPs is required to maximise patient recovery.
- At each follow-up opportunity after hip fracture, GPs should assess the patient's functional recovery.
- Secondary fracture prevention, including falls prevention, management of osteoporosis, sarcopenia and frailty, is an integral part of long-term care.
- Acute or chronic hip pain after surgery must be addressed, and ongoing exercise is important to improving long-term functional outcomes.
- An orthopaedic surgeon's assessment should be sought urgently if a prosthetic hip joint infection is suspected, and antibiotics should not be commenced before orthopaedic consultation.

Types of hip fracture and surgery

Broadly, there are two types of hip fracture, which require different surgical management:

- intracapsular hip fractures – true femoral neck fractures which have a poor blood supply and are at risk for non-union and avascular necrosis
- extracapsular hip fractures – fractures of the trochanteric region, which has a good blood supply that promotes healing.

Intracapsular hip fractures

The treatment of choice for an intracapsular fracture depends on the degree of displacement and patient age. If the fracture is minimally displaced then the risk of avascular necrosis is low and fracture stabilisation is warranted by either insertion of screws alone or with a plate and sliding screw, known as a dynamic hip screw (Figure 1a).[7]

In displaced intracapsular fractures, hip arthroplasty is preferred to avoid the risk of failure of fixation or avascular necrosis requiring reoperation (Figures 1b and c).[7] As physical demands are lower in most older patients with limited life expectancy, a hemiarthroplasty is performed leaving a metal femoral head replacement to articulate with the native acetabulum.[7]

In patients with pre-existing hip osteoarthritis, total hip replacement is considered, accepting the higher risk of dislocation.[7] Total hip replacement is also performed in patients who are more active and independent, to avoid the secondary arthritis that can occur with hemiarthroplasty.[8]

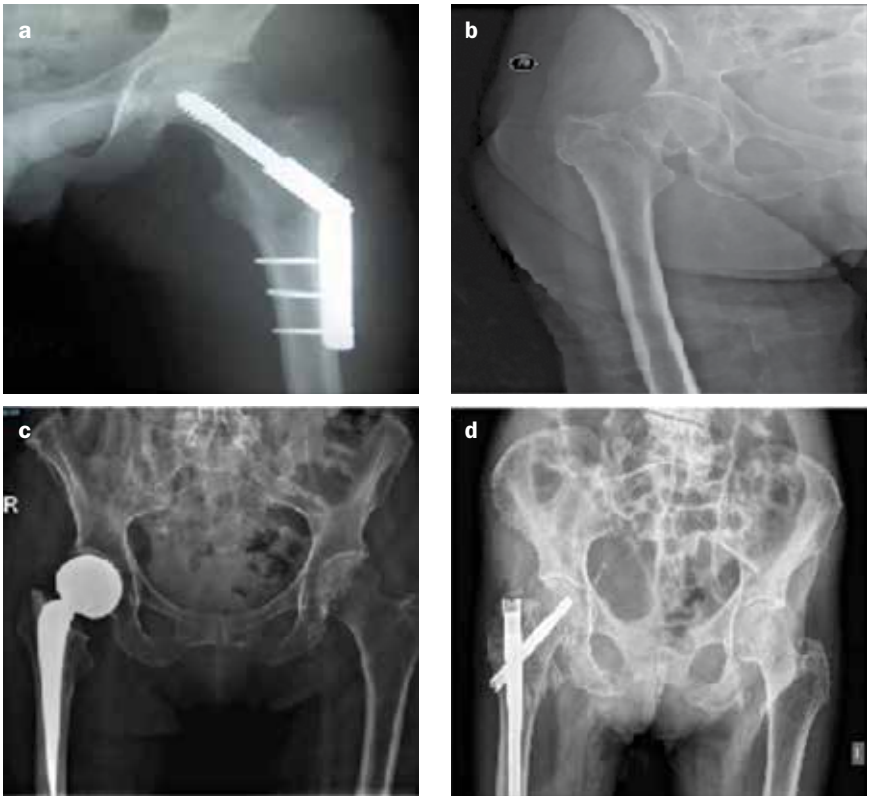
Hip arthroplasty can be performed via an anterior, lateral or posterior approach. Each approach has advantages and disadvantages, as outlined in Table 1. Most Australian institutions perform hip arthroplasty by either a lateral or posterior approach.[9] The lateral approach has a smaller risk of dislocation but risks damage to the hip abductor muscles leading to a limp (Trendelenburg gait).[10]

The posterior approach has a greater risk of dislocation but preserves the abductor muscles, and a limp is less likely long term. However, patients must avoid flexion and low sitting positions for up to 12 weeks or longer, as instructed by the orthopaedic surgeon, which can be a problem in many patients with cognitive impairment.

More recently, the anterior approach seems to have been growing in popularity. This approach preserves the abductor muscles and has a low dislocation risk.[11] However, it carries a greater risk of both intraoperative fracture and wound complication.[12]

TABLE 1. ADVANTAGES AND DISADVANTAGES OF DIFFERENT SURGICAL APPROACHES TO HIP ARTHROPLASTY

Surgical approach	Advantages	Disadvantages
Posterior	• Preservation of abductor muscles (less limp)	• Higher risk of hip dislocation
Lateral	• Smaller risk of dislocation	• Removal of part of abductor muscles resulting in limp • Risk of secondary pain in lower back and trochanteric region • Greater risk of reliance on assistive device postoperatively
Anterior	• Smaller incision • Faster recovery • Less reliance on assistive device	• Higher intraoperative fracture • Higher wound complication



Figures 1a to d. X-rays showing a range of hip fracture types and treatments. a (top left). Intracapsular fracture of the neck of the left femur with minimal displacement, fixed with a dynamic hip screw. b (top right). A displaced intracapsular fracture of the neck of the femur, which is at high risk of avascular necrosis. c (bottom left). A right hemiarthroplasty in a patient with a displaced intracapsular fracture of the neck of the femur. d (bottom right). An intramedullary nail used to treat an extracapsular right intertrochanteric femoral fracture.

Extracapsular hip fractures

For extracapsular fractures, the treatment of choice is internal fixation. Open reduction and fixation with a dynamic hip screw provides sufficient stability to allow fracture healing by controlled collapse of the femoral neck via the lag screw onto the barrel plate.[13] The disadvantage of this approach is that the more unstable the initial fracture, the greater the collapse, resulting in shortening of the femoral neck and leg, which in turn leads to abductor weakness and a limp.

The alternative is an intramedullary nail, which offers biomechanical advantages, improved anatomical alignment and less shortening. However this procedure requires inserting the nail through the trochanter, which may also result in injury to the hip abductor muscles (Figure 1d).[14] This approach is increasingly the treatment of choice because it usually involves a smaller incision and is more comfortable for the patient, allowing immediate unrestricted weight bearing (likely because of increased stability), which improves rehabilitation potential. The previously high intraoperative complication rate associated with intramedullary nails has been largely overcome by design modifications and technical improvements.

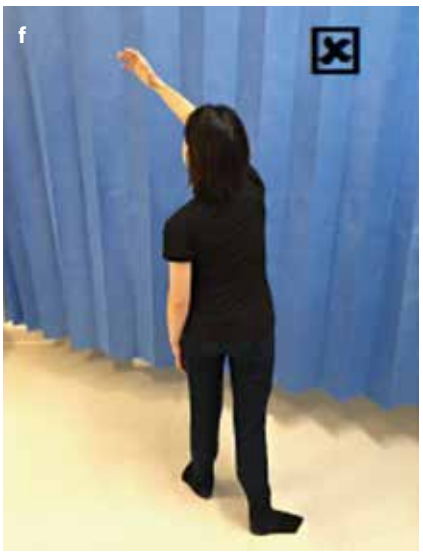
Postoperative management

Implant failure and complications at the fracture site

Patients with total hip replacements are at risk of hip dislocation while the new joint heals. Therefore, they are cautioned to limit certain physical movements for three months, depending on the operative approach and implant type (Figure 2). Generally, regardless of the approach used, patients are advised to avoid sitting on low chairs, crossing the legs and excessive forward bending. The common surgical approaches and the various movements allowed or to be avoided are summarised in Box 1.

At present, there is no standard guideline as to when repeat imaging is required after hip fracture surgery. In clinical practice, many factors influence whether a person has follow-up radiographs, including logistics and cost. In older people who are bed bound, repeat plain radiographs are taken as required when fracture or dislocation is suspected or when recommended by the operating surgeon. In ambulatory patients, a plain radiograph is taken between six and eight weeks after surgery for extracapsular fracture or for intracapsular fracture treated with internal fixation, to assess for fracture healing. Repeat imaging is undertaken after arthroplasty if a prosthesis-related complication is suspected.

Intracapsular fractures have a higher risk than extracapsular fractures of avascular necrosis, malunion or non-union caused by poor blood supply to the region. Avascular necrosis occurs in 9 to 18% of patients, up to eight years after the fracture; risk factors include the degree of fracture displacement, patient age and delay in surgical treatment.[15] Avascular necrosis may be initially painless but over time causes pain and limits hip movement. Eventually, pain is typically localised in the groin or ipsilateral buttock region but may also manifest as referred knee pain aggravated by weight bearing. Assessment with plain radiographs and/or a radionuclide bone scan is necessary when avascular necrosis is suspected unless titanium (MRI compatible) implants were used, in which case an MRI scan can be used. Non-union is reported mainly in severely comminuted fractures with bone loss.



Figures 2a to f. Hip movements that are allowed (√) or prohibited (X) after hip fracture surgery, to prevent hip dislocation or device failure (examples show right-sided surgery).
a (top left). Hip flexion is allowed to an angle of 90 degrees or less.
b (top right). Hip flexion must never exceed 90 degrees.
c (centre left). Feet should be kept together when lying on the side.
d (centre right). Leg must never be rolled inwards.
e (left). Leg must never be crossed over when lying down.
f (bottom left). Patients should avoid reaching overhead with an outstretched arm (i.e. leaning forward and/or turning the body away from the affected side, with the affected leg fixed to ground). This movement extends and externally rotates the affected hip joint, predisposing to anterior hip dislocation.

For extracapsular fractures, the three most common complications of surgery are screw cut-out, periprosthetic femur fracture and implant failure.[16] Periprosthetic femur fracture occurs more often in patients treated with intramedullary nails, particularly first-generation nails, which have a larger distal diameter, at a rate of about 5.3%.[17] Implant failure usually appears as a result of poor fracture reduction, mechanical stress or fracture instability, but may also be caused by technical error.

1. MOVEMENTS TO BE AVOIDED AFTER HIP ARTHROPLASTY BY DIFFERENT SURGICAL APPROACHES BECAUSE OF DISLOCATION RISK*

All surgical approaches

- Avoid sitting on low chairs
- Avoid crossing the legs
- Avoid excessive forward bending

Posterior approach

- Avoid hip flexion greater than 90 degrees (Figure 2b)
- Avoid hip adduction past the mid line of the body (Figure 2d)
- Avoid hip internal rotation past neutral (Figure 2e)

Lateral approach

- As for posterior approach
- Also avoid hip extension and external rotation (i.e. reaching overhead) (Figure 2f)

Anterior approach

- Precautions are similar to those for the posterior and lateral approaches, but movements are less restricted
- Avoid hip hyperextension and extreme external rotation (i.e. toes pointing outward)

* Positions are to be avoided for up to 12 weeks or longer, as instructed by the orthopaedic surgeon.

Surgical site infection

The prevalence of surgical site infections is 1 to 3% in patients with acute hip fracture.[18,19] Deep wound infections impair functional ability and increase mortality in elderly patients.[18] Postoperative hip infections are usually occult, so a high index of suspicion is required. An orthopaedic surgeon's assessment should be sought urgently and antibiotics should not be commenced prior to orthopaedic consultation. Generally, in all suspected cases, a hip joint washout, bone and tissue biopsy will be performed, preferably before administration of antibiotics.

Venous thromboembolism

All patients admitted to hospital for hip fracture should receive thromboprophylaxis following surgery unless contraindicated by a high bleeding risk. According to the 2012 NHMRC clinical guideline for prevention of venous thromboembolism (VTE) in Australian hospitals, recommendations are for all patients to use thromboprophylaxis for up to 35 days after hip fracture surgery.[20] If pharmacological options are contraindicated then intermittent pneumatic leg compression or foot pumps are mandatory until patients are ambulatory.

For patients who are suspected to have developed deep vein thrombosis (DVT) or pulmonary embolism after hip fracture surgery, investigations should involve compression ultrasonography for DVT and CT pulmonary angiography or ventilation–perfusion scintigraphy for pulmonary embolism.

Initial treatment of VTE is with low molecular weight heparin (LMWH) or unfractionated heparin for at least five days, followed by warfarin (target international normalised ratio of 2.0 to 3.0) for at least three months.[21] Data on the use of the new nonvitamin K antagonist oral anticoagulants (NOACs) is limited in older people, especially those with moderate renal impairment (creatinine clearance ≤50 mL/min) or chronic liver disease.[22] Furthermore, the absence of a reversing agent for the NOACs may delay surgery if patients sustain another hip fracture (given that the risk of re-fracture is high in this age group).

Decisions regarding the optimal duration of anticoagulation to prevent recurrent VTE should be individualised, and the risk of recurrence if warfarin is stopped needs to be weighed against the risk of major bleeding.

Long-term management

Recovery continues throughout the first year after surgery and beyond, which is an opportunity to rehabilitate or restore function. Patterns of recovery vary by functional domain: cognition, activities of daily living, gait or balance (Table 2).[23] Comprehensive treatment plans should therefore be developed in partnership with the patients and their carers, with realistic goals set and reviewed.[24]

TABLE 2. TIME TO RECOVERY AFTER HIP ARTHROPLASTY BY DOMAIN

Domain	Approximate time to recovery
Upper extremities, cognition, mood	4 months
Gait and balance	9 months
Physical and instrumental activities of daily living	12 months

For patients aged 75 years and older, it might be timely to update their 75+ Health Assessment (Australian general practice) and institute a refreshed management plan. The long-term management of patients after hip fracture should include appropriate prescription of medications, referral to exercise and falls prevention programs, encouragement of good nutrition and addressing cognitive and psychosocial needs.

Secondary fracture prevention

Secondary prevention of subsequent fracture is an important aspect of care after a person sustains a hip fracture (Flowchart). However, secondary prevention is often overlooked after acute hospital care is complete. Hence, GPs play an important role in implementing preventive strategies. These include:

- falls prevention
- evaluation and management of osteoporosis.

Falls prevention

When older people fall, the cause is frequently multifactorial and requires a multidisciplinary interventional approach targeting risk factors (Box 2). Multifaceted interventions are more likely to be effective than single interventions for reducing falls and related injuries. Components include:[25,26]

- strength and balance exercises
- reduction or cessation of psychotropic, anticholinergic or hypovolaemic medications
- ensuring proper footwear and mobility aids when mobilising
- regular assessment and appropriate treatment of visual impairment.

Osteoporosis evaluation and management

Studies have shown that investigation for osteoporosis after fracture is often suboptimal, and patients with low-energy fractures may not be evaluated or receive any treatment for underlying osteoporosis.[27] Osteoporosis assessment should ideally include, as well as history taking and physical examination, measurement of bone mineral density and relevant laboratory investigations, including measurement of serum calcium, inorganic phosphate, 25-hydroxyvitamin D (25-OHD), creatinine, parathyroid hormones, thyroid-stimulating hormone and free thyroxine levels, serum and urine protein electrophoresis (if multiple myeloma is suspected) and also serum testosterone measurement in men.[28] Interpretation of the 25-OHD level should take into account the clinical context, including any chronic disease.

Lifestyle modifications such as smoking cessation, minimisation of alcohol intake and weight-bearing exercises should also be emphasised to improve patients' bone and general health.[29] Generally, a serum 25-OHD level of at least 50 nmol/L at the end of winter (10 to 20 nmol/L higher at the end of summer, to allow for seasonal decrease) is required for optimal musculoskeletal health.[30] Recent guidelines from the Australian and New Zealand Bone and Mineral Society and Osteoporosis Australia recommended a daily calcium intake of

AN APPROACH TO SECONDARY FRACTURE PREVENTION

Patient presents after treatment of hip fracture

Step 1. Education and motivation

- Educate and motivate patients with a recent hip fracture to engage in their management plans

Step 2. Evaluation

- Assess clinical risk factors for fractures
- Assess falls risk
- Assess for frailty, sarcopenia, poor nutrition, cognitive and mood disorders
- Evaluate dietary calcium intake and risk for vitamin D insufficiency
- Determine bone mineral density

Step 3. Consider differential diagnoses

- Laboratory examination for secondary osteoporosis and metabolic bone disease
  - Serum calcium and phosphate
  - Serum creatinine
  - 25-hydroxyvitamin D
  - Thyroid function test
  - Parathyroid hormone
  - Serum and urine protein electrophoresis (if multiple myeloma is suspected)
  - Androgen studies (for men)

Step 4. Therapy

- Engage in shared decision-making and establish realistic treatment goals
- Support lifestyle modifications (cease smoking, reduce alcohol intake, take regular exercise)
- Recommend calcium and vitamin D supplementation where indicated
- Prescribe antiosteoporosis medications
- Implement falls prevention interventions

Step 5. Follow up

- Monitor adherence to management plan
- Evaluate efficiency of treatments
- Monitor for any adverse effects of treatment
- Review duration of therapy

2. RISK FACTORS FOR FALLS

- Age 80 years or over
- Fall(s) in the preceding 12 months
- Gait or balance disorder
- Dementia or delirium
- Incontinence
- Syncope or dizziness
- Vitamin D deficiency
- Taking more than three medications, particularly psychotropic medications
- Visual impairment or use of bifocal or multifocal spectacles when walking
- Inappropriate footwear (e.g. slippers) or presence of foot pain
- Requiring supervision for ambulation
- Environmental factors such as clutter, poor lighting, stairs and floor rugs

1000 mg (1300 mg for those aged over 70 years) and, for people with minimal sun exposure, a daily vitamin D intake of 600 IU (800 IU for those aged over 70 years).[30]

Several pharmacological options have been shown to be effective in reducing future fracture risk and to be well tolerated in older people. Bisphosphonates are currently recommended as first-line treatment for osteoporosis, but poor compliance with oral administration, even by missing a few doses, limits their clinical benefit, resulting in significantly higher rates of preventable osteoporotic fractures.[29,31] Alternatives for treating osteoporosis include an antiresorptive agent (denosumab) or an anabolic agent (teriparatide).[28] Antiresorptive therapy beyond five years should be reviewed on a case-by-case basis, guided by assessment of the overall fracture risk and the drug's efficacy and safety profile.[32] Any cessation of therapy warrants ongoing annual monitoring of subsequent fracture risk.[32]

Management of frailty and sarcopenia

There is a bidirectional association between frailty, sarcopenia and hip fractures. Frailty is 'characterised by diminished strength, endurance and reduced physiologic function that increases an individual's vulnerability

TABLE 3. FRAIL SCALE AND SARC-F SCORE FOR SARCOPENIA

Component	Question	Score
FRAIL scale[35]		
Fatigue	Are you fatigued?	Score 1 point for each 'yes' answer
Resistance	Cannot walk up one flight of stairs?	
Ambulation	Cannot walk one block?	
Illness	Do you have more than five illnesses?	
Loss of weight	Have you lost more than 5% of your weight in the past six months?	
Total score		Total ≥3 = frail 1 to 2 = pre-frail 0 = robust
SARC-F score[36]		
Strength	How much difficulty do you have lifting and carrying 4.5 kg?	None = 0 Some = 1 A lot or unable = 2
Assistance in walking	How much difficulty do you have walking across a room?	None = 0 Some = 1 A lot, use aids or unable = 2
Rise from a chair	How much difficulty do you have transferring from a chair or bed?	None = 0 Some = 1 A lot or unable without help = 2
Climb stairs	How much difficulty do you have climbing a flight of 10 stairs?	None = 0 Some = 1 A lot or unable = 2
Falls	How many times have you fallen in the past year?	None = 0 1 to 3 falls = 1 ≥4 falls = 2
Total score		Total ≥4 = sarcopenia

for developing increased dependency or death'.[33] Sarcopenia, which is closely associated with frailty, is defined as an age-related progressive decline in skeletal muscle mass, strength and function.[34] Validated questionnaire tools such as the FRAIL scale and SARC-F score can be used to screen for frailty and sarcopenia, respectively (Table 3). Consideration should be given to incorporating these tools into the 75+ Health Assessment.[35-37]

Sarcopenia and frailty can be treated and prevented through optimising participation in physical therapy or exercise in addition to improving nutritional health.[37] Management of frailty was reviewed comprehensively in the August 2015 issue of *Medicine Today*.[37] A common barrier for participation in physical exercise is pain. After hip fractures, up to 42% of older patients experience persistent residual pain three to four months postoperatively, and around a quarter continue to experience moderate to very severe pain from six to 12 months after hospital discharge.[38,39] Attention should be given to ensuring continuing adequate pain control strategies in patients with hip fractures.[40] Sudden onset of worsening pain should prompt evaluation because it may indicate an associated hip problem, such as trochanteric bursitis or loss of fixation, dislocation, infection or osteonecrosis of the hip.

Management of cognitive and mood disorders

Cognitive impairment may be present in up to 42% of people with hip fractures.[41] It is important to make a timely diagnosis of dementia so that appropriate pharmacological therapy and nonpharmacological supports can be instituted. People with dementia have a higher risk of falling compared with those without dementia, and its presence has been shown to adversely affect hip fracture recovery.[42] Although there is a misperception that dementia is an impediment to recovery, there is a growing body of evidence that rehabilitation can lead to gains in function in patients with dementia. It is important that programs are tailored for patients with dementia to support their participation.[43]

Delirium occurs in about 10 to 65% of patients with hip fracture while they are hospitalised, and as many as one-third of patients with delirium have persistent symptoms after discharge.[44] Patients with delirium benefit from multicomponent interventions, including reduction of unnecessary medications, frequent orientation, adequate pain control and assistance with ambulation.

Depression and fear of falling are common after hip fractures, leading to psychological consequences. Clinically significant depression develops in 14 to 20% of people after hip fracture.[45] Furthermore, 50% or more of patients experience a fear of falling after sustaining a hip fracture.[46] Depression and fear of falling are associated with an increased risk of further isolation, inactivity and elevated fracture risk.[47] Postoperative pain and anxiety symptoms are potentially modifiable factors associated with depression. Effective management for depression includes patient education, psychotherapy, pharmacotherapy and ongoing monitoring. However, antidepressants can cause imbalance and falls. Therefore, older people taking antidepressants should be

monitored carefully to avoid increasing fall and fracture risk.

Antibiotic prophylaxis in dental care

Prosthetic joint infection is a dire complication after joint replacement surgery. It has long been suggested that bacteraemia introduced during dental treatment is a major cause of late prosthetic joint infection, through seeding of the prosthesis via the haematogenous route.[48] However, there is limited evidence to support this theory. Dental neglect is common in older people, who often prioritise other aspects of health.[49] Patients should have a dental assessment as soon as they are well enough after prosthetic joint replacement and be rendered dentally fit. Maintaining good oral hygiene and regular dental reviews should eliminate any possible source of infection originating from the oral cavity. Routine antibiotic prophylaxis before dental treatment is no longer recommended for patients with prosthetic joint replacements.[50]

Transitions in care

After a hip fracture, people often experience multiple handovers during care transitions across different settings, such as from hospital to a rehabilitation facility, from rehabilitation to home and at times rehospitalisation for complications. On average, a patient experiences about 3.5 changes in care in the six months after a hip fracture.[51] Transitions of care are vulnerable points for errors and adverse events.[52] Comprehensive, timely and accurate clinical handovers are important. Interventions targeted at improving care transitions are necessary and can reduce rehospitalisation.[53]

Psychosocial support is an important factor that affects recovery after hip fractures.[54] Caregivers often experience frustrations with communication in healthcare delivery and caregiving-related activities.[55] Therefore GPs need to proactively and empathetically communicate with caregivers. Patients both with and without caregivers should be referred for additional social services when there is a need. Support groups bring together people experiencing similar difficulties, helping to restore social interaction and self-confidence, and consideration should be given to linking people into social groups.

Conclusion

Successful recovery from a hip fracture involves prolonged treatment. GPs are best placed to support this treatment, in partnership with patients, carers and other community care providers. The assessment and treatment of osteoporosis, frailty and cognition are often limited in the acute hospital care setting. GPs are in a position to ensure that these aspects of care are addressed after patients are discharged from hospital. MT

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A list of references is included in the website version of this article (www.medicinetoday.com.au).

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