



**Australian and New Zealand Society for Geriatric
Medicine**

Position Statement 5

Orthogeriatric care Revised 2010

Orthogeriatric care is medical care for older patients with orthopaedic disorders that is provided collaboratively by orthopaedic services and, aged care or rehabilitation services.

1. Orthogeriatric care is applicable to all older patients with hip and other bone fragility fractures – including pelvis, vertebra, ankle, humerus, forearm and other long bones. Some older patients with soft tissue injuries, and joint or back pain will also benefit.
2. Early multidisciplinary co-ordinated care reduces in-hospital mortality and medical complications in patients with hip fracture, and improve functional recovery. One person should be identified as coordinator and have responsibility for monitoring the effectiveness of the treatment program. Key disciplines are geriatric medicine / rehabilitation medicine, nursing, physiotherapy, occupational therapy, social work, and orthopaedic surgery. Other disciplines should be available on a consultative basis.
3. Orthogeriatric care should commence on, or soon after, admission to hospital. Orthopaedic surgeons with suitable training and experience should supervise the surgical treatment of orthogeriatric patients.
4. Patients should stay for a minimum time in the emergency and X-ray departments. Definitive surgery, if required, should be arranged as soon as possible (within 24 hours). Few patients will have a medical contraindication to surgery.
5. Each patient should be offered treatment to enable him/her to rapidly return to physical independence. The aim should be discharge to home as soon as safe mobility is regained.
6. Periods of immobilisation, immobility and limited weight-bearing should be kept to a minimum. Patients with hip fracture should commence mobilisation within 48 hours of surgical treatment, bearing weight as desired. An exception is the patient with an unstable trochanteric fracture who may require a period of limited weight bearing.
7. Premorbid disability, cognitive function and social support should be carefully reviewed and documented as these affect management (including discharge planning) and are major predictors of long term outcome. Geriatricians have a key role in the assessment and management of medical co-morbidities.
8. Patients should be assessed with reference to likelihood of recovery. According to recovery prognosis, a range of options for orthogeriatric care should be available and an individualised management plan formulated.
9. Patient, family or carer should be contacted to seek information and to ensure acceptability of the management plan. The patient (and family with the patient's consent) should be closely involved with the treatment process.
10. Functionally based nursing, as well as a therapy program with primary emphasis on independent mobility and self care, should be provided as a routine part of orthogeriatric care.
11. For some patients the injury is the result of severe disabling conditions without remediable elements. If recovery is not possible the priority is provision of appropriate surgical and medical treatment, accommodation and support. Included in this group are almost all patients previously resident in a high level aged care facility.
12. Patients should be discharged from hospital as soon as function is adequate to permit support in an appropriate non-hospital setting.
13. Mobility aids and home equipment (particularly bathroom aids) will be required by many patients. Staff from the orthogeriatric service should prescribe these items and arrange for their supply. Community support services should be efficiently and appropriately arranged.
14. The patient's general practitioner should be contacted for consultation, to provide information and to expedite follow-up. There should be similar liaison with institutional care providers.
15. A period of ongoing rehabilitative treatment is required by almost all patients. This may be provided at home, at a residential aged care facility or other ambulatory settings. Domiciliary treatment should be available and is preferred by many patients. Treatment or follow-up should continue until disability stabilises.
16. Secondary prevention should be provided as a component of orthogeriatric care. Risk factors for falling should be minimised. Most people living in residential aged care facilities are calcium and Vitamin D deficient, and almost all frail older people with fractures have osteoporosis.

Adequate treatment with calcium and vitamin D supplementation, as well bone-protection agents (such as oral / intravenous bisphosphonates or strontium ranelate) is recommended for patients without contra-indications. The optimal level of calcium supplementation is currently unclear.

17. Audit of clinical practice with reference to specific guideline recommendations should be undertaken.

This Position Statement represents the views of the Australian Society for Geriatric Medicine. This Statement was approved by the Federal Council of the ASGM on 29 November 1996 and revisions were approved on 14 November 2004 and 29 November 2010.

The revision of this paper was coordinated by Dr Jenson Mak, Dr Evelyn Wong and Professor Ian Cameron.

BACKGROUND PAPER

1. The Scope of Orthogeriatric Care

Orthogeriatric care was pioneered by Devas and colleagues in Hastings, UK in the late 1950s [1]. The term geriatric orthopaedics was used and was defined as "a combination of medicine and orthopaedics applied to the elderly" [1]. The originator of the term orthogeriatric care is harder to identify. It is however, synonymous with geriatric orthopaedics. The topic has been the subject of a comprehensive text [2]. For the purpose of this paper, orthogeriatric care is medical care for older patients with orthopaedic disorders that is provided collaboratively by orthopaedic services and programs catering for older people.

2. Development of Orthogeriatric Care

Devas and his colleagues developed a system of care that stressed the need for rapid definitive treatment of older people with trauma so that these patients could walk immediately. This group also stressed the need for team care, full and open communication with the patient and family and utilised the principles of geriatric assessment [1].

Recently the British Geriatrics Society has published a framework document on Orthogeriatric Services. The outcomes of fracture in older people have been shown to be much better when there is close collaboration between departments of orthopaedics and geriatric medicine [3].

3. Key Research Studies

Hip fracture is the most important condition that is included in the ambit of orthogeriatric care and hence most of the research has been in this area.

The natural history of hip fracture is well understood. Without surgical treatment patients with hip fracture have a 70% one-year mortality and 80% of the survivors are severely disabled. With surgical treatment there is a 30% one year mortality and 40% of survivors are severely disabled [4]. Surgical treatment is applied differently according to the type of fracture. Treatment options include either internal fixation or arthroplasty. For an undisplaced subcapital fracture (about 10% of all patients) internal fixation with cancellous bone screws or compression screw and plate are used [5]. Treatment for displaced subcapital fractures (35% of all patients with hip fracture) is subject to some debate and geographic variation. In Australasia (and the UK), it is more cost effective to offer hemiarthroplasty to older or more disabled patients with this fracture compared to internal fixation because whilst it is associated with greater initial operative trauma, it has a lower risk of implant failure needing reoperation [5]. Younger patients with displaced subcapital fractures (5% of all patients) are often recommended to have a closed reduction and internal fixation [6]. Total hip replacement can be considered for some patients.

In trochanteric fractures, treatment is generally agreed. Fixation with a sliding hip screw is preferable over intramedullary nails as it has been shown to have a lower complication rate [7-10]. It is used for both two part (20% of all patients) and the majority of multi-part (30% of all patients) trochanteric fractures.

On the other hand, in subtrochanteric fractures (including reverse oblique and transverse intertrochanteric fractures), intramedullary nails appear to be superior to a sliding hip screw as it may result in shorter duration of surgery, shorter hospital stay, fewer orthopaedic complications and less need for major re-operations [11].

As surgical techniques improved, the opportunity for immediate postoperative weight-bearing was realised. This applies to both intra- and extracapsular fractures. The need for appropriate surgical technique has been stressed [12]. In the 1970s and 1980s the concepts of early mobilisation, home rehabilitation and support services after hip

fracture were recognised as an alternative to the transfer of patients to an orthogeriatric ward [13, 14].

Since the mid 1980s a number of randomised trials of orthogeriatric care have been published. The Cochrane Collaboration Review of Coordinated Multidisciplinary Inpatient Rehabilitation after Hip Fracture has conducted a meta-analysis of these randomised trials [9]. In parallel with studies specifically dealing with orthogeriatric care, studies of geriatric assessment have been published. Reviews of the randomised trials in this area have concluded that comprehensive geriatric assessment with control over medical recommendations; multidisciplinary rehabilitation and extended follow-up were likely to be more effective than usual care [15, 16]. Many of the principles of comprehensive geriatric assessment should be applied in orthogeriatric care.

4. An Australian and New Zealand Perspective

Australasian authors were among the leaders in describing principles of orthogeriatric care. In 1980 Lefroy described a system of orthogeriatric care and emphasised the need for a combined effort between orthopaedic surgeons and members of the extended care service to effectively treat patients with hip fracture [17].

Gray, Dorevitch and others noted that there were 30 orthogeriatric services operating in Australia as part of a hospital geriatric service [18]. Only 11% of comprehensive hospital geriatric services in Australia reported specific orthogeriatric services. However, this number is likely to have increased significantly in the last five years.

5. Details of Orthogeriatric Care

There are two evidence-based clinical practice guidelines that cover the scope of Orthogeriatric Care [19, 20], both of which have been recently updated.

5.1 Multidisciplinary team

All authors stress the need for the skills available from a team of health professionals [21]. Key disciplines are also generally agreed as described in the introduction.

5.2 The organisation of orthogeriatric care

Orthogeriatric care can be provided as part of a general aged care service or as a specific program within an aged care service or within another department (for example an orthopaedic department).

5.3 Admission and pre-operative care

5.3.1 Investigations

In almost all patients plain x-rays will confirm the diagnosis. Occasional patients will require bone or CT scanning to resolve uncertainty.

5.3.2 Time to surgery

Current guidelines suggest surgery within 24-36 hours if the patient's medical condition permits [19,20]. If the patient was ambulant prior to hip fracture, most will require operation as long as there is no major anaesthetic contraindication. Surgery should not be delayed in patients with hip fractures taking antiplatelet therapy [22]. For patients on Warfarin who are deemed appropriate to have the anticoagulant effect reversed, withholding it combined with the administration of oral or intravenous vitamin K is recommended to permit earlier surgery [23,24].

Routine additional cardiac investigation such as an echocardiography prior to surgery in older people with hip fracture is not indicated. If the need for echocardiography, based on clinical history, physical examination and ECG findings is warranted, rapid access to an echocardiography service is recommended to avoid unnecessary delay to surgery [25].

About 5% of patients may have no surgery for medical or surgical reasons. Orthogeriatric care should commence on, or soon after, admission to hospital.

5.3.3 Pre-operative traction

Routine use of preoperative skin and skeletal traction should be abandoned as there is no current evidence to support it [26].

5.3.4 Prevention of pressure ulcers

Attention to pressure area care, in particular, should begin in the emergency department. Pressure ulcers are very common but can be prevented [27]. Predisposing factors are poor physical condition, impaired mental state, immobility, inactivity and incontinence. The heel on the fractured side is especially vulnerable. Pressure areas usually develop early in the hospital stay due to immobilisation for long periods on high-pressure surfaces. It can be prevented by nursing patients on low pressure patient support systems (usually alternating pressure air mattresses) until mobility is restored.

5.3.5 Medical (including cognitive), functional and social assessment

A medical (including cognitive and nutritional), functional and social assessment should be performed. Most patients will have had significant past illnesses. Of relevance particularly is active ischaemic heart disease, chronic obstructive airways disease, congestive cardiac failure or recent symptomatic cerebrovascular disease. Many patients will have dementia. This is an adverse prognostic factor, frequently being complicated by delirium in the perioperative period [28]. Discussion with a third party may be required to distinguish the diagnoses of delirium and dementia. Geriatricians have a key role in the assessment and management of medical co-morbidities.

5.3.6 Fluid and electrolyte balance

Management of fluid and electrolyte balance in older people is crucial and should begin as early as in the emergency department. It should be monitored closely throughout admission in hospital.

5.3.7 Nutritional status

Attention has been drawn to the effect that nutritional state has on prognosis in hip fracture. A nutritional assessment should be done on all patients so that any protein and energy supplements can be provided as needed. These supplements may improve outcome for undernourished patients [29]. Dietetic assistants can also be used to help improve nutritional intake.

5.3.8 Type of analgesia

The issue of the type of analgesia to use is the subject of discussion. Adequate analgesia should be administered before and immediately after surgery. Some investigators suggest that local or regional anaesthesia is appropriate and have demonstrated that it is effective. However, at present most patients receive parenteral narcotic analgesics. Three-in-one femoral nerve block provides effective analgesia pre and post operatively [30]

In some patients medical conditions require stabilisation. However the number for whom surgery should be delayed should be small. Stabilisation is better considered as the prevention of deterioration while awaiting surgery. Fluid balance, pressure area care, cognitive status, nutritional factors and continence require attention.

5.4 Peri-operative care

5.4.1 Type of anaesthesia

There is still insufficient evidence available from randomised trials to confirm or rule out clinically important differences between regional versus general anaesthesia for hip fracture surgery. Based on the available evidence, regional analgesia is recommended for most patients as it may reduce post operative confusion [31]. However, in patients taking dual antiplatelet therapy, general anaesthesia is recommended [32].

5.4.2 Operator experience

Less experienced surgeons who were still in training had a significantly higher rate of complications. Surgeons performing the surgery on patients with proximal femoral fracture should be proficient in the technique performed. Surgical complications have been shown to greatly increase the use of hospital resources after hip fracture [33].

5.4.3 Type of surgery

A total hip replacement rather than a hemiarthroplasty should be the primary treatment in patients with pre-existing joint disease, medium/high activity levels and a reasonable life expectancy [34]. When undertaking hemi-arthroplasty, it is recommended that cement should be used unless there are cardiorespiratory complications, particularly in frail older patients [35].

As discussed, there is consensus regarding the treatment of trochanteric fractures. In contrast, there is no clear consensus for subcapital fractures. Displaced (Garden 3 and 4) fractures have a different prognosis to undisplaced (Garden 1 and 2) fractures. Displaced fractures can be either reduced and pinned or subjected to hemiarthroplasty (the majority outcome for Australian patients) or closed reduction and internal fixation (more common for the younger patient) [7].

5.4.4 Indwelling urinary catheter

The geriatric medical literature suggests that urinary catheters should be avoided where possible, and, if not, removed post-operatively. If needed, intermittent catheterisation is preferable as it has been shown not to increase the incidence of urinary tract infections [36]. Urinary retention should be avoided.

5.4.5 Thromboprophylaxis

Anti-coagulants for prophylaxis of DVT and pulmonary embolism have mostly been studied in the context of total hip replacement. These data can be applied to hip fracture patients. Meta-analyses

are consistent in finding that, compared to placebo, low dose heparin and low molecular weight heparin reduce the risk of DVT and pulmonary embolism [37]. It has also been shown that aspirin significantly reduces the incidence of thrombo-embolic complications [38]. All high risk hip fracture patients should receive low dose heparin or low molecular weight heparin for up to 4 weeks or at least until mobile. In patients whom anticoagulants and antiplatelet agents are contraindicated, mechanical devices should be used [39]. In addition, it is highly recommended that patients wear pressure gradient stockings as soon as possible after admission.

5.4.6 Prophylactic antibiotics

A number of studies have shown the benefit of prophylactic intravenous antibiotics which should be given at the time of induction for surgery and continued for a total of 24 hours post-operatively [40]. Currently, there no proven benefit of topical antibiotic use for prophylaxis of wound infection [41]. The prevalence of deep infection after surgery for hip fracture should be low (<2%).

5.4.7 Blood transfusion

Local data suggests that about 50% of patients are transfused intra- or post-operatively. Transfusion is more common after trochanteric fractures or total arthroplasty. Indications for transfusion after proximal femoral fracture vary but can be summarised as a post-operative haemoglobin of less than 90 g/L or slightly higher if associated with a clinical problem (most commonly delirium). Routine transfusion in asymptomatic patients with a haemoglobin level more than 80g/L may not be required [42]. Iron supplementation is used almost routinely for several months after fracture but there are no controlled trials to support this.

5.5 Post-operative care

Patients should be assessed with reference to likelihood of recovery. According to recovery prognosis and the availability of social supports, a range of options for orthogeriatric care should be available and an individualised management plan should be formulated.

5.5.1 Post-operative analgesia

Analgesics in the post-operative period are essential. Simple analgesics (paracetamol) should be given regularly and supplemented, if required, by other agents. Care should be taken to provide adequate analgesia for patients with delirium or

dementia as research has shown that these patients are undertreated. Routine post operative assessment and formal charting of pain scores should also be carried out. Those receiving opioids need particular attention to prevention of constipation.

5.5.2 Early mobilisation

Patients with hip fracture should commence mobilisation within 24-48 hours of surgical treatment, bearing weight as tolerated [19,43]. In previously community dwelling individuals, early assisted ambulation accelerates functional recovery resulting in more direct discharges home and less discharges to high-level care [44]. An exception is the few patients with unstable trochanteric fractures who require a period of limited weight bearing. Excessive adduction or flexion at the injured hip should be avoided in order to reduce the risk of dislocation in patients with arthroplasty.

5.5.3 Nursing care

The nursing care offered should encourage the physical independence of the patient and provide emotional support. Key areas are feeding, continence and transfers (functionally based nursing). The signs of common complicating conditions are suspected early, monitored and managed appropriately – eg. delirium, pressure areas, urinary retention and constipation [45].

5.5.4 Reducing post-operative delirium

Proactive geriatric consultations may reduce the incidence and severity of delirium in patients undergoing surgery for hip fracture, which is an adverse prognostic factor [28,46]. This is often related to an underlying dementing illness which has been exacerbated by the stress of the hip fracture. Relatives and carers can be warned this is likely. Some components underlying the delirium may be preventable and/or remediable [28, 45]. The severity and duration of delirium episodes may be reduced by prophylactic low-dose haloperidol, shortening the length of hospital admission for hip surgery [47].

5.5.5 Coordination of hip fracture care

Several studies have suggested that programs for the post-operative care of patients with hip fracture work best when one person is nominated as coordinator of the treatment program [19].

Patient, family or carer should be consulted to seek information and to ensure acceptability of the

management plan. The patient (and family with the patient's consent) should be closely involved with the treatment process.

5.5.6. Models of orthogeriatric care

Sub-types of orthogeriatric care have been recognised in the last five years. The NHS Health Technology Assessment Programme has commissioned a systematic review of the evidence in respect of Geriatric Rehabilitation Following Fractures in Older People [48]. The review is guarded in its conclusions about free standing Geriatric Orthopaedic Rehabilitation Units, because the additional cost of such units does not appear to be justified by improvements in patient outcome. In contrast, the review concludes that there is good evidence to support development of collaborative approaches in the acute setting such as the Geriatric Hip Fracture Program, as these do appear effective in improving outcome. It also suggests a benefit from the use of Early Supported Discharge schemes for selected less disabled patients, and perhaps of Care Pathways to expedite rehabilitation and discharge.

5.6 Rehabilitation

Coordinated multidisciplinary rehabilitation programs should be offered to patients with hip fracture with the specific aim of regaining sufficient function to return to their pre-fracture living arrangements. These programs should include early individualised occupational therapy during hospital admission, continuous rehabilitation as well as discharge planning (including a home visit and post-acute care coordination when appropriate) Evidence have shown that this improves physical outcomes, quality of life and self-care abilities, reduce readmission rates and depression, may reduce risk of falling and may be associated with cost savings [15,16].

5.6.1 Independent mobility

Mobilisation is usually commenced with a forearm support frame. When mobility is possible using this aid and without the aid of another person there is progression to a pick-up frame or wheeled frame. The more active patient may use crutches. Bed exercises have some place but are no substitute for weight-bearing. No particular mobility training program can be recommended on the basis of randomised trial evidence [43]. In order to enhance patients' aerobic fitness and mobility after hip fracture surgery, aerobic endurance exercise (upper body) may be integrated into standard rehabilitation

[49]. Weight bearing home exercise programs have also been found to improve balance and functional ability among older people who have completed usual care after a hip fracture [50].

5.6.2 Self care

Training to encourage physical independence (that is independence in activities of daily living) is essential. This will be part of functionally oriented nursing care. Assessment by the occupational therapist should be provided in the ward and a home visit will be required for most patients living in community settings. Adaptive equipment is usually supplied (a toilet surround, toilet raiser, and shower chair at a minimum).

5.6.3 Analgesia

Simple analgesics (paracetamol) should be given regularly and supplemented, if required, by other agents.

5.6.4 Psychological support

Psychological support should be offered to all patients. This will be part of the usual nursing and team-based care. Depressive symptoms are common after hip fracture and have been shown to be an adverse prognostic indicator [28].

5.6.5 Discharge planning

Discharge directly home from the acute care ward should be the aim if possible. There is likely to be a lengthening of total length of hospital stay if there is transfer to another ward [51]. However, in most hospitals a significant number of patients will need to be transferred to another ward. A decision as to whether this is required should be made within a few days of operation and, if transfer is needed, it should be arranged as soon as possible.

5.7 Other issues

Other factors should be noted. Oedema of the lower limb with the hip fracture is very common. In the vast majority of cases it is not indicative of a clinically significant deep venous thrombosis and should be treated by elevation or elastic or pneumatic support. The diagnosis of a deep venous thrombosis should be investigated if oedema or pain related to the oedema worsens during the recovery period.

There is leg shortening in up to one third of patients with trochanteric fractures. If this is greater than 2 cms, a heel raise may assist. Persistent severe pain from the hip in the postoperative or rehabilitation

phase raises the suspicion of a failure of fixation at the fracture site or wound infection.

5.8 Discharge

Hospital discharge can be arranged when the patient is ambulant with a walking aid and able to toilet without help. Timing of discharge is also dependent on the wishes of the patient, the family and, in some cases, the availability of community health services and residential care. An accelerated discharge and home rehabilitation program may lead to functional improvement, greater confidence in avoiding subsequent falls, improvements in health-related quality of life and less caregiver burden [52-54]. Mobility aids and home equipment (particularly bathroom aids) will be required by many patients. Staff from the orthogeriatric service should prescribe these items and arrange for their supply. Community support services should be efficiently and appropriately arranged. The patient's general practitioner should be contacted for consultation, to provide information and to expedite follow-up. There should be similar liaison with institutional care providers.

Careful discharge planning can reduce the length of hospital stay and may contribute to improved long term outcome. If the patient's level of function is not improving over a period of one to two weeks, goals should be reviewed as institutional care or additional support services may be required.

For some patients the injury is the result of severe disabling conditions without reversible elements. If recovery is not possible, the priority is provision of appropriate medical and surgical treatment, accommodation and support. Patients from a high level aged care facility can be discharged back there when their medical condition is stable with mobility retraining to occur in the high level aged care facility. It should be established that the residential aged care facility has the resources and expertise to do this.

5.8 Follow-up

Rehabilitative treatment is required after hospital discharge. It should be functionally oriented and there is a trend to provide it in the patient's home. Extended outpatient rehabilitation programs that include progressive resistance training have been shown to improve physical function and quality of life compared with home exercise alone [55].

Follow-up should be arranged until the patient has regained the level of independence present prior to the fracture, or until it has stabilised at a lower level. This should be assessed in the patient's home and could be done by a health professional from any one of a range of disciplines (including the patient's general practitioner). Orthopaedic follow-up is required only if there is a specific indication (eg. concern re the fixation or chance of avascular necrosis) or continuing pain.

5.9 Secondary Prevention

All patients presenting with fragility fractures need an assessment and intervention to reduce their risk of future osteoporotic fracture as well as their risk of additional falls.

5.9.1 Falls prevention

Most fractures result from a fall that is generally a consequence of an interaction between multiple and diverse risk factors and situations, many of which can be corrected. Recurrent falls have been shown to be associated with increased mortality, increased hospitalization rates, limitations to daily activities and more institutionalisations. In addition, there also psychological effects on a patient following a fall such as loss of confidence, increased fear of falling again, lower quality of life and post-fall anxiety syndrome [56].

The British Geriatric Society's guidelines suggest that a multidisciplinary assessment and interventions should be offered to all patients who present with a fragility fracture following a fall. A detailed history of the circumstances leading to the fall, including enquiry into previous falls is important as it will allow examination, investigations and appropriate interventions to be more effective. Falls prevention advice should be given [56].

5.9.2 Role of hip protectors

Hip protectors have been shown to reduce the risk of hip fracture in institutionalised patients, but not in community-dwelling older people. At present, the use of hip protectors is yet to be widely accepted by patients due to their discomfort and impracticality [57].

5.9.3 Bone protection

Recent guidelines [19,20] state that all patients presenting with fragility fracture should be assessed to determine their need for oral or intravenous anti-

resorptive therapy or strontium ranelate to prevent future osteoporotic fractures.

For previously independent older women, it is recommended that vitamin D supplementation through injection or given orally suppresses parathyroid hormone, increases bone mineral density and reduces falls after hip fracture. In frailer, housebound or institutionalised people, fewer hip and other non-vertebral fractures may be sustained if given vitamin D with calcium supplements. The optimal level of calcium supplementation is currently unclear. Intravenous zoledronic acid may improve mortality and it is recommended that this is given when the patient is vitamin D-replete (25-hydroxyvitamin D > 50nmol/L). A reduction in the rate of new clinical vertebral and non-vertebral fractures and an improvement in survival after a low-trauma hip fracture have been found with an annual infusion of zoledronic acid [58].

Oral alendronate and oral risedronate are also associated with reductions in rates of vertebral and non-vertebral fractures [59,60]. Strontium ranelate was found to reduce the rates of vertebral and non-vertebral fractures in post menopausal women with osteoporosis, and reduce the risk of hip fractures in women aged 74 or older whose bone mineral density fits clinical criteria for osteoporosis [61, 62]. Prescription prior to discharge from the orthogeriatrics service may improve prescription rates and long-term adherence. Secondary causes of osteoporosis should be excluded and managed appropriately if present.

The use of a case manager after hip fracture may help to increase the number of investigations (such as bone mineral density testing) performed and increase prescription rates of bone-protective agents [63]. In addition, appropriate therapeutic intervention by general practitioners may be increased by introducing a perioperative intervention program which involves patient education and provision of a list of questions for the GP.

5.9.4 Audit

Current clinical practice should be audited on a regular basis with reference to specific guideline recommendations [19].

References

1.Devas, M., ed Geriatric Orthopaedics. New York: Academic Press 1997

- 2.Newman, R.J., ed. Orthogeriatrics: Comprehensive Orthopaedic Care for the Elderly Patient. Oxford: Butterworth Heinemann 1992
- 3.British Geriatrics Society, 'Standards of Medical Care for Older People Expectations and Recommendations: Best Practice Guide 1.3 2007. Available from: http://www.bgs.org.uk/index.php?option=com_content&view=article&id=35:gpstandardsofcare&catid=12:goodpractice&Itemid=39 Accessed 8 April 2010.
- 4.Parker, M.J., Myles, J.W., Anand, J.K. & Drewett, R. Costbenefit analysis of hip fracture treatment. Journal of Bone Joint Surgery, 1992: (Br) 74B, 261-4.
- 5.Parker MJ, Gurusamy K. Internal fixation versus arthroplasty for intracapsular proximal femoral fractures in adults. Cochrane Database Syst Rev 2006; (4) : CD001708.
6. Parker, M.J. & Pryor, G.A. Hip Fracture Management. Oxford: Blackwell Scientific Publications 1993.
7. Parker MJ, Tripuraneni G, McGreggor-Riley J. Osteotomy, compression and reaming techniques for internal fixation of extracapsular hip fractures. Cochrane Database of Systemic Reviews 2009; 1.
8. Parker MJ, Handoll HHG. Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults. Cochrane Database Syst Rev 2008;(3): CD000093.
9. Saudan M, Lubbeke A, Sadowski C, et al. Pertrochanteric fractures: is there an advantage to an intramedullary nail?: a randomized, prospective study of 206 patients comparing the dynamic hip screw and proximal femoral nail. J Orthop Trauma 2002; 16: 386-393.
10. Papisimos S, Koutsojannis CM, Panagopoulos A, et al. A randomised comparison of AMBI, TGN and PFN for treatment of unstable trochanteric fractures. Arch Orthop Trauma Surg 2005; 125: 462-468.
11. Sadowski C, Lubbeke A, Saudan M, et al. Treatment of reverse oblique and transverse intertrochanteric fractures with use of an intramedullary nail or a 95 degrees screw-plate: a prospective, randomized study. J Bone Joint Surg (Am) 2002;84: 372-381.
- 12.Ainsworth, T. Immediate full weight-bearing in the treatment of hip fractures. Journal of Trauma, 1997: 11, 1031-40.
- 13.Jarnlo, G.B., Ceder, L. & Thorngren, K.G. Early rehabilitation at home of elderly patients with hip fractures and consumption of resources in primary care. Scandinavian Journal of Primary Health Care, 1984: 3, 105-12.

14. Pryor, G.A., Myles, J.W., Williams, D.D.R. & Anand, J.K. Team management of the elderly patient with hip fracture. *Lancet*, 1988; 1, 419-20.
15. Handoll HHG, Cameron ID, Mak JCS, Finnegan TP. Multidisciplinary rehabilitation for people with hip fractures. *Cochrane Database of Systematic Reviews* 2009, Issue 4. Art. No.: CD000106. DOI: 10.1002/14651858.CD000106.pub2.
16. Bachman S, Finger C, Huss A, Egger M, Stuck AC, Clough-Gorr KM. Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomized trials. *BMJ* 2010;340:c1718.
17. Lefroy, R.B. Treatment of patients with fractured neck of the femur in a combined unit. *Med J Aust* 1980; 132, 669-70.
18. Gray L, Dorevitch M, Smith R, Black K, Ibrahim J, Virgona M. Service Provision for Older People in the Acute - Aged Care System: final report. Canberra, COAWG; 2002.
19. Scottish Intercollegiate Guidelines Network (SIGN) Number 111. Management of Hip Fracture in Older People. A National Guideline. Edinburgh SIGN. 2009. Available from <http://www.sign.ac.uk/pdf/sign111.pdf>. Accessed 17 April 2010
20. Mak JCS, Cameron ID, March LM. Evidence Based Guidelines for Management of Hip Fractures in Older Persons: an Update. *Med J Aust* 2010; 192 (1): 37-41 Available from <http://www.mja.com.au/public/guides/guides.html>. Accessed 17 April 2010
21. Currie, C.T. Hip fractures in the elderly: beyond the metalwork (editorial). *British Medical Journal*, 1989; 298, 4734.
22. Douketis J, Berger P, Dunn A, Jaffer A, Spyropoulos A, Becker R, et al. The perioperative management of antithrombotic therapy: American College of Chest Physicians evidence based clinical practice guidelines (8th edition). *Chest* 2008; 133(6 Suppl): 2995-3395.
23. Dezee KJ, Shimeall WT, Douglas KM, Shumway NM, O'Malley PG. Treatment of excessive anticoagulation with phytonadione (vitamin K): a meta-analysis. *Arch Intern Med* 2006; 166 (4):391-7.
24. Watson HG, Baglin T, Laidlaw SL, Makris M, Preston FE. A comparison of the efficacy and rate of response to oral and intravenous Vitamin K in reversal of over-anticoagulation with warfarin. *Br J Haematol* 2001; 115 (1): 145-9.
25. American College of Cardiology/American Heart Association Task Force Guidelines on perioperative cardiovascular evaluation and care for non cardiac surgery. *J Am Coll Cardiol*, 2007;50 (17): e159-e241.
26. Parker MJ, Handoll HHG. Pre-operative traction for fractures of the proximal femur in adults. *Cochrane Database Syst Rev* 2006; (3): CD000168.
27. McInnes E, Cullum NA, Bell-Syer SEM, Dumville JC. Support surfaces for pressure ulcer prevention. *Cochrane Database of Systematic Reviews* 2008, Issue 4. Art. No.: CD001735. DOI: 10.1002/14651858.CD001735.pub3.
28. Mossey, J.M., Mutran, E., Knott, K. & Craik, R. Determinants of recovery 12 months after hip fracture: the importance of psychosocial factors. *American Journal of Public Health*, 1989; 79, 279-86.
29. Avenell A, Handoll HHG. Nutritional supplementation for hip fracture aftercare in older people. *Cochrane Database of Systematic Reviews* 2010, Issue 1. Art. No.: CD001880. DOI: 10.1002/14651858.CD001880.pub5.
30. Parker MJ, Griffiths R, Appadu BN. Nerve blocks (subcostal, lateral cutaneous, femoral, triple, psoas) for hip fractures. *Cochrane Database Syst Rev* 2002; (1): CD001159.
31. Parker MJ, Handoll HHG, Griffiths R. Anaesthesia for hip fracture surgery in adults. *Cochrane Database of Systematic Reviews* 2004, Issue 4. Art. No.: CD000521. DOI: 10.1002/14651858.CD000521.pub2.
32. Chassot P, Delabays A, Spahn D. Perioperative antiplatelet therapy; the case for continuing therapy in patients at risk of myocardial infarction. *Br J Anaesth* 2007; 99 (3): 316-28.
33. Jensen, J.S. & Tondevd, E. A prognostic evaluation of the hospital resources required for the treatment of hip fractures. *Acta Orthopaedica Scandinavica*, 1980: 51, 515.
34. Parker MJ, Gurusamy KS. Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD001706. DOI: 10.1002/14651858.CD001706.pub3.
35. Christie J, Robinson C, Singer B, Ray D. Medullary lavage reduces embolic phenomena and cardiopulmonary changes during cement hemiarthroplasty. *J Bone Joint Surg Br* 1995; 77(3):456-9.
36. Skelly JM, Guyatt GH, Kalbfleisch R, et al. Management of urinary retention after surgical repair of hip fracture. *CMAJ* 1992; 146: 1185-1189.

37. Handoll HHG, Farrar MJ, McBirnie J, et al. Heparin low molecular weight heparin and physical methods for preventing deep vein thrombosis and pulmonary embolism following surgery for hip fractures. *Cochrane Database Syst Rev* 2002; (4).
38. PEP Investigators. Prevention of pulmonary embolism and deep vein thrombosis with low dose aspirin: Pulmonary Embolism Prevention (PEP) trial. *Lancet* 2000; 355: 1295-1302.
39. CD000305 Imperiale, T.F. & Speroff, T. A meta-analysis of methods to prevent venous thromboembolism following hip replacement. *Journal of the American Medical Association*, 1994; 271, 1780-5.
40. Southwell-Keely JP. Russo RR. March L. Cumming R. Cameron I. Brnabic AJ. Antibiotic prophylaxis in hip fracture surgery: a meta-analysis. *Clinical Orthopaedics & Related Research*. 2004;419:179-84.
41. Kamath S, Sinha S, Shaari E, et al. Role of topical antibiotics in hip surgery. A prospective randomised study. *Injury* 2005; 36: 783-787.
42. Carson JL, Terrin ML, Barton FB, et al. A pilot randomized trial comparing symptomatic vs. hemoglobin-level-driven red blood cell transfusions following hip fracture. *Transfusion* 1998; 38:522-529.
43. Handoll HHG, Sherrington C. Mobilisation strategies after hip fracture surgery in adults. *Cochrane Database of Systematic Reviews* 2007, Issue 1. Art. No.: CD001704. DOI: 10.1002/14651858.CD001704.pub3.
44. Oldmeadow LB, Edwards ER, Kimmel LA, et al. No rest for the wounded: early ambulation after hip surgery accelerates recovery. *ANZ J Surg* 2006; 76:607-611.
45. [Milisen K](#), [Foreman MD](#), [Abraham IL](#), [De Geest S](#), [Godderis J](#), [Vandermeulen E](#), [Fischler B](#), [Delooz HH](#), [Spiessens B](#), [Broos PL](#). A nurse-led interdisciplinary intervention program for delirium in elderly hip-fracture patients. *J Am Geriatr Soc*. 2001 May;49(5):523-32.
46. Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: a randomized trial. *J Am Geriatr Soc* 2001; 49: 516-522.
47. Kalisvaart KJ, de Jonghe JF, Bogaards MJ, et al. Haloperidol prophylaxis for elderly hip-surgery patients at risk for delirium: a randomized placebocontrolled study. *J Am Geriatr Soc* 2005; 53: 1658-1666.
48. Cameron ID, Crotty M, Currie C, Finnegan T, Gillespie L, Gillespie W, Handoll H, Kurrle S, Madhok R, Murray G, Quinn K, Torgerson D. Geriatric Rehabilitation following fractures in older people: a systematic review. *Health Technology Assessment* 2000; 4(2):1-111.
49. Sherrington C, Lord SR, Herbert RD. A randomized controlled trial of weight-bearing versus nonweight-bearing exercise for improving physical ability after usual care for hip fracture. *Arch PhysMed Rehabil* 2004; 85: 710-716.
50. Crotty M, Whitehead CH, Gray S, Finucane PM. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomized controlled trial. *Clin Rehabil* 2002; 16: 406-413.
51. Parker MJ et al. Inter-hospital variations in length of hospital stay following hip fracture. *Age and Ageing* 1998; 27:333-7.
52. Kuisma R. A randomized, controlled comparison of home versus institutional rehabilitation of patients with hip fracture. *Clin Rehabil* 2002; 16: 553-561.
53. Tsao JY, Leu WS, Chen YT, Yang RS. Effects on function and quality of life of postoperative homebased physical therapy for patients with hip fracture. *Arch Phys Med Rehabil* 2005; 86: 1953-1957.
54. Crotty M, Whitehead C, Miller M, Gray S. Patient and caregiver outcomes 12 months after homebased therapy for hip fracture: a randomized controlled trial. *Arch Phys Med Rehabil* 2003; 84: 1237-1239.
55. Binder EF, Brown M, Sinacore DR, et al. Effects of extended outpatient rehabilitation after hip fracture: a randomized controlled trial. *JAMA* 2004; 292: 837-846
56. Anonymous. AGS / BGS Clinical Practice Guideline: Prevention of falls in older persons. American Geriatrics Society and British Geriatrics Society. 2009. Available from: http://www.americangeriatrics.org/health_care_professionals/clinical_practice/clinical_guidelines_recommendations/prevention_of_falls_summary_of_recommendations. Accessed 30 May 2010
57. Parker MJ, Gillespie WJ, Gillespie LD. Hip protectors for preventing hip fractures in older people. *Cochrane Database Syst Rev* 2005; (3): CD001255.
58. Lyles KW, Colon-Emeric CS, Magaziner JS, et al; HORIZON Recurrent Fracture Trial. Zoledronic acid and clinical fractures and mortality after hip fracture. *N Engl J Med* 2007; 357: 1799-1809.
59. Wells GA, Cranney A, Peterson J, et al. Risedronate for the primary and secondary prevention of osteoporotic fractures in postmenopausal women. *Cochrane Database Syst Rev* 2008; (1): CD004523.
60. Wells GA, Cranney A, Peterson J, et al. Alendronate for the primary and secondary prevention of osteoporotic fractures in

postmenopausal women. Cochrane Database Syst Rev 2008; (1): CD001155.

61. Reginster JY, Felsenberg D, Boonen S, et al. Effects of long-term strontium ranelate treatment on the risk of nonvertebral and vertebral fractures in postmenopausal osteoporosis: results of a five-year, randomized, placebo-controlled trial. *Arthritis Rheum* 2008; 58: 1687-1695.
62. Seeman E, Vellas B, Benhamou C, et al. Strontium ranelate reduces the risk of vertebral and nonvertebral fractures in women eighty years of age and older. *J Bone Miner Res* 2006; 21: 1113-1120.
63. Majumdar SR, Beaupre LA, Harley CH, et al. Use of a case manager to improve osteoporosis treatment after hip fracture: results of a randomized controlled trial. *Arch Intern Med* 2007; 167: 2110-2115.