Article Review of Proximal Femoral Fractures

Submitted to the Council of the College of Medicine,

Dyala University, In Partial Fulfillment of Requirements

For the Bachelor Degree in Medicine and General Surgery

Submitted by

Ahmed Mohammed Khalil Mohammed

Supervised by

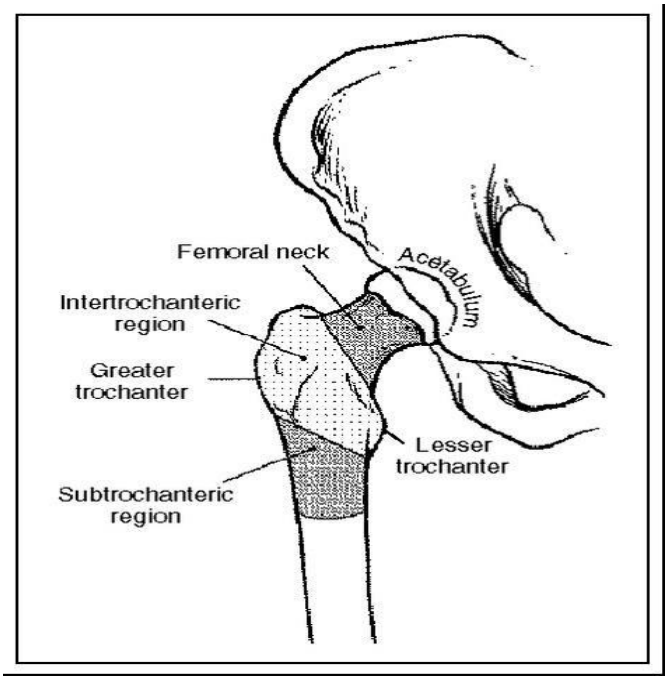
Ass. Prof. Dr. Ammar Najim

Abstract

Hip fractures are fractures of the proximal femur and are commonly seen in the elderly population following a fall. This type of injury has a high rate of morbidity and mortality. To reduce this, surgical intervention is often required. This activity reviews the assessment and management of hip fractures and highlights the importance of the interprofessional team. One of the major factors contributing to a deterioration in the quality of life and independence of older adults is osteoporosis and hip fracture. Recent advances in our knowledge of the causes of hip fracture are providing new and effective approaches to the prevention of this disabling condition. Because hip fracture is a leading cause of disability, significant efforts have been directed to the development of strategies for the more effective rehabilitation and treatment of the fracture patient.

Introduction

Hip fractures, particularly in older persons, result in problems that extend far beyond the orthopedic injury, with repercussions in the areas of medicine, rehabilitation, psychiatry, social work, and health care economics. There are over 250,000 hip fractures in the United States each year, with 90 percent occurring in patients over the age of 50 years.[1] With the aging of the population, the annual number of hip fractures is projected to double by the year 2040. [1,2]It is unlikely that efforts to prevent these injuries will have a substantial effect in the foreseeable future. Therefore, it is imperative that we continue to refine our treatment approaches, with the goal of improving the outcome.



(Figure 1)

A hip fracture is generally a fracture of the proximal femur. Such injuries are divided into three categories, according to the anatomical area in which they occur (Figure 1). Femoral-neck fractures are located in the area distal to the femoral head but proximal to the greater and lesser trochanters and are considered intracapsular fractures, because they are located within the capsule of the hip joint. This anatomical characteristic has important implications for healing. Fractures in this area, particularly those involving marked displacement, can disrupt the blood supply to the femoral head and are therefore associated with an increased incidence of healing complications (nonunion and osteonecrosis of the femoral head).[3] Intertrochanteric fractures, which occur in the well-vascularized metaphyseal region between the greater and lesser trochanters, are extracapsular fractures that do not interfere with the blood supply to the proximal femur. These fractures are thus not associated with the healing complications characteristic of femoral-neck fractures.[4] The most common complications of intertrochanteric fractures are malunion and shortening as a result of the deforming forces and compromised bone quality in this area of the proximal femur. Subtrochanteric fractures are those that occur just below the lesser trochanter. Femoral-neck and intertrochanteric fractures

account for over 90 percent of hip fractures, occurring in approximately equal proportions,[5,6] and subtrochanteric fractures account for the remaining 5 to 10 percent .

Etiology

The majority of hip fractures are the result of a fall in the elderly population. Risk factors for falls in the elderly population are numerous, but those with a strong independent association are a previous history of falls, gait abnormalities, the use of walking aids, vertigo, Parkinson disease, and antiepileptic medications.[7] Many patients have multiple risk factors, and this, along with age-associated reduced bone quality, is the underpinning cause of most hip fractures.

Hip fractures that occur in younger adults are often the result of high-energy trauma. These patients are likely to have incurred multiple injuries and should be assessed and managed appropriately as per local trauma guidelines.

Around 5% of hip fractures have no history of trauma, and in these cases, an alternative cause should be suspected.[8] A pathological fracture is defined as a fracture caused by a disease process and not related to trauma. The two most frequent causes in relation to hip fractures are malignancy and bisphosphonate use. Arguably many more hip fractures could be described as pathological due to underlying osteoporosis, but this group is rarely labeled in this way.

HISTORY AND PHYSICAL

Most hip fractures can be diagnosed, or at least suspected, from history alone. Classically a fall leads to a painful hip with an associated inability to walk. Clinicians should explore potentially sinister causes of the fall, such as syncope, stroke, or myocardial infarction. As these patients are often

elderly with a complex medical background, a full medical history is vital and should include both a history of the presentation as well as a full assessment of the patient's medical background. A thorough social history that provides baseline mobility and the patient's home circumstances is also of great value and is likely to guide postoperative rehabilitation and discharge planning.

It is recommended that a cognitive assessment be performed in all patients presenting with hip fractures. Ideally, this should be done both on admission and post-operatively. The aim of this is to recognize patients with underlying dementia or those who are developing an acute delirium, both of which are associated with a poorer prognosis.[9]

The physical examination will demonstrate pain, immobility, and potentially a deformed limb. The degree of deformity seen is dependent on both the anatomical configuration of the fracture and the degree of displacement. The classically described presentation is a shortened and externally rotated limb due to the unopposed pull of the iliopsoas muscle that attaches to the lesser trochanter. Recognizing this, deformity immediately makes one suspicious of a hip fracture. Further examination often reveals pain on any, or all, of the following: palpation in the groin or greater trochanter, axial loading of the hip, and 'pin-rolling' of the leg.

A full primary trauma and secondary trauma assessment should be performed to assess the patient for other injuries. It is always useful to assess the patient's cardiovascular and respiratory status prior to undergoing surgery. Specific examinations to identify the cause of the fall should also be considered.

The Garden classification is a more commonly recognized classification system for intracapsular hip fractures. It describes four fracture patterns and defines them based on the completeness and displacement of the fracture.

- Type 1: incomplete fracture and no displacement
- Type 2: complete fracture and no displacement
- Type 3: complete fracture and partial displacement
- Type 4: complete fracture and complete displacement

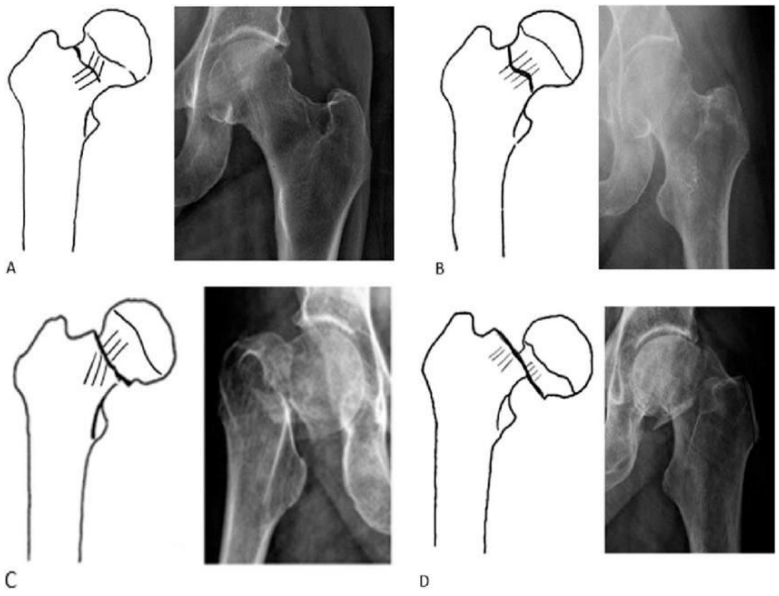


Figure 2: The Garden Classification

Diagnosis

Most hip fractures are easily diagnosed on the basis of clinical findings and standard radiographs. However, some patients report hip pain after a fall, with difficulty standing or walking, but no fracture is seen on radiographs (an anteroposterior view of the pelvis and a true lateral view of the hip). In these patients, hip fracture should be considered the diagnosis until proved

otherwise, because of the consequences of overlooking an occult fracture. An anteroposterior view obtained with the hip internally rotated 15 to 20 degrees will provide an optimal image of the femoral neck and may reveal a fracture not evident on the standard anteroposterior view. If this radiograph is also normal and clinical findings support the diagnosis of a hip fracture, technetium-99m bone scanning or magnetic resonance imaging (MRI) is appropriate.19 The bone scan is a sensitive indicator of an unrecognized hip fracture, although in elderly patients the fracture may not appear until two or three days after the injury. MRI has been shown to be as accurate as bone scanning in the assessment of occult hip fractures, and reliable results can be obtained within 24 hours after the injury. The decreased incidence of false negative results associated with MRI has made it the preferred diagnostic test. In the absence of a hip fracture, possible diagnoses include a pubic ramus fracture, an acetabular fracture, an isolated fracture of the greater trochanter, and trochanteric bursitis or contusion.(figure 3 A and b)

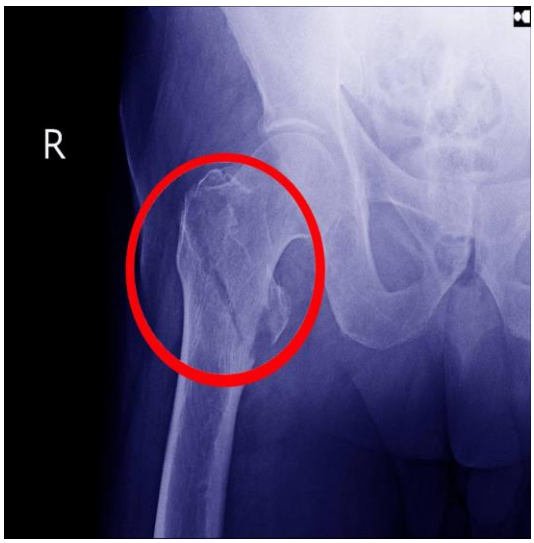


Figure 3 a (hip fracture).

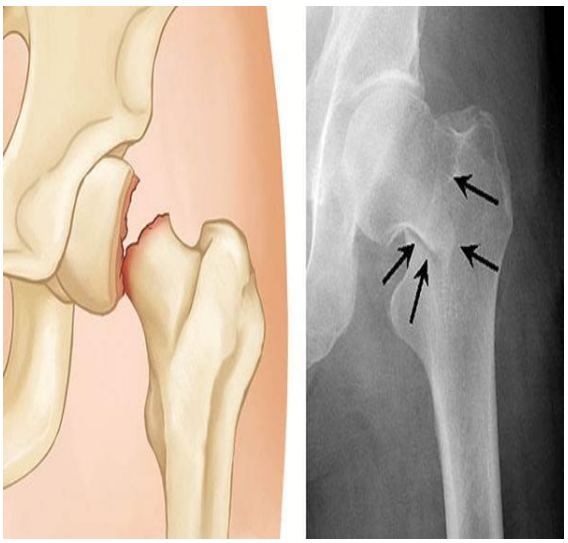


Figure 3 b

Treatment And Management

Initial management begins in the emergency department. Patients can lose up to 1 liter of blood from proximal femoral fractures, and thus fluid replacement and blood transfusion should be early considerations.

Prolonged periods of preoperative fasting should be minimized, and nutritional supplementation should be made available until a likely time of operative intervention is known. Prolonged fasting is associated with increased catabolism, hypoglycemia, immunosuppression, and dehydration.[10] Hip fracture patients are particularly susceptible to complications of dehydration, and adequate pre and peri-operative hydration should be ensured.[11] Preoperative fasting times vary by hospital. The European Society of Anaesthesiology recommends fasting from fluids for 2 hours and from food for 6 hours prior to surgery.[12]

Oral or intravenous analgesia should be administered, but achieving adequate pain control can be challenging. It is now recommended that a fascia-iliaca nerve block be used in the preoperative period to reduce analgesia requirements and associated morbidity.[13] It is not advisable to apply limb traction, or attempt closed reduction in the emergency department.

The definitive management is largely dependent on the fracture location and configuration. The pre-morbid function and medical background of the patient are also considered, as well as their personal preferences. The approach, as with assessment, should involve the wider interprofessional team. The primary aim is to restore the patient's mobilization status as swiftly as possible, and therefore operative intervention is normally preferred. Conservative management for fractured hips is associated with a

higher 30 day and 1-year mortality and is generally reserved for patients who are not fit for surgery. Early surgery in hip fracture patients is linked with improved outcomes, and therefore operating within 48 hours of admission is recommended. Hyper-acute surgery, represented as surgery within 6 hours, does not reduce mortality or the rate of major complications but nor does it increase patient risk. Hyper-acute surgery does reduce the rate of delirium and decreases the length of hospital stay by 1 day.

Surgical Repair

Patients with hip fractures require a meticulous initial medical evaluation to identify any comorbid conditions that may affect the treatment plan. The approximate time of injury should be ascertained, because elderly patients who live alone are often not brought to the emergency room for hours or even days after the injury, by which time they may be confused and dehydrated. Fluid and electrolyte imbalances and cardiopulmonary problems (particularly congestive heart failure) must be corrected before surgery can be performed. The internist or geriatrician is an important member of the treatment team and is responsible for stabilizing the patient for surgery.

The timing of surgery is important. In general, it should be performed as soon after the injury as possible, usually within 24 to 48 hours after admission, an interval that allows adequate time to address any medical problems. Unnecessarily long intervals before surgery increase the risk of postoperative medical complications and mortality at one year.21 As noted above, a delay to stabilize an acute medical condition can be beneficial.22,23 Any delay has to be considered very carefully, however, since prolonged bed rest before surgery increases the risk of other problems, including deep venous thrombosis, pulmonary complications, urinary tract infection, and skin breakdown. Decisions about the timing of

surgery require close interaction between the internist or geriatrician and the orthopedic surgeon. The type of surgery is based on the characteristics of the fracture (location, bone quality, displacement, and comminution), a careful assessment of the patient (his or her age, level of function before the injury, and ability to participate in a postoperative rehabilitation program), and the surgeon's experience.

Femoral-neck fractures can be treated by either internal fixation with multiple screws or prosthetic replacement. Internal fixation is generally used in patients with nondisplaced or minimally displaced fractures (Figure 4 a, b) and in younger patients (<70 years) with displaced fractures. The incidence of nonunion and osteonecrosis is much higher with displaced fractures (30 to 40 percent) than with nondisplaced fractures (<10 percent).

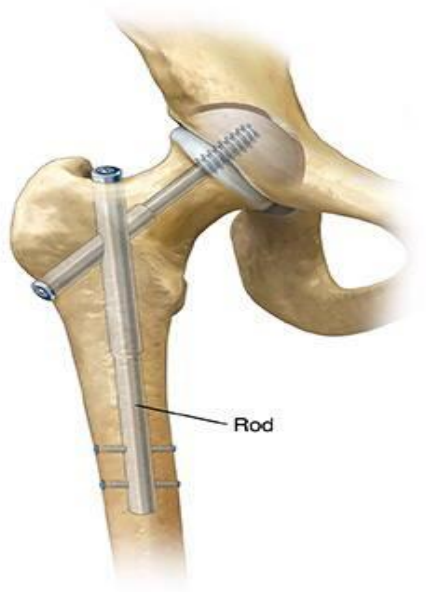


Figure 4 a ,b (Internal Fixation of Hip Fracture)

Prosthetic replacement is therefore generally preferred in older patients with displaced fractures, to minimize the possibility of these complications. (Figure 5)

figure 5 (prosthetic replacement)

Intertrochanteric fractures are usually treated by internal fixation with a sliding hip screw or similar device .

Subgroups of patients with hip fractures require special consideration. Patients with Parkinson's disease are at increased risk for subsequent hip fractures because of the increased risk of falling.[14] If prosthetic replacement for a femoral-neck fracture is indicated in a patient with Parkinson's disease, it may be necessary to use an anterior surgical approach and release the soft-tissue contracture to reduce the risk of postoperative prosthetic dislocation. Similarly, patients who have had a stroke are at increased risk for hip fracture because of osteopenia of the paretic limb and residual balance and gait problems.[14] When prosthetic replacement is indicated in such patients, the surgical considerations are similar to those for patients with Parkinson's disease. Patients with symptomatic rheumatoid arthritis or osteoarthritis of the hip generally require total hip replacement after a fracture.[14] In patients with Paget's disease, careful

monitoring for hypercalcemia is required, and bed rest should not be prolonged. Preexisting hip degeneration may be encountered in such patients and is an indication for total hip replacement. Patients with hip fractures that occur as a result of metastatic disease are at increased medical and surgical risk because of the underlying neoplastic process. Preoperative imaging studies are necessary to identify metastatic lesions that may be present in the femoral shaft or other remote sites (such as the spine or contralateral leg), since the presence of such lesions will affect the treatment approach. In general, prosthetic replacement is preferred, although certain intertrochanteric fractures require internal fixation augmented with bone cement.

The choice of anesthesia (general or regional) is made by the anesthesiologist in consultation with the internist or geriatrician and the orthopedic surgeon. General anesthesia is indicated in patients with idiopathic hypertrophic subaortic stenosis, a bleeding disorder, or the need for ongoing anticoagulation; those with serious preexisting pulmonary disease require regional anesthesia. The type of anesthesia does not affect the incidence of postoperative confusion or mortality in elderly patients with hip fractures.[15,16]

The use of perioperative antibiotics has significantly decreased the incidence of postoperative infection in patients with hip fractures.[17] The first dose of antibiotics is usually given in the operating room just before the start of the surgery.

Complication

The complications following a hip fracture are vast, diverse, and multi-factorial. Infection rates following surgical management of fractured hips are between 0.6-3.6%, but these vary depending on the operation type.[50] Other generic surgical complications include postoperative pain, bleeding, neurovascular injury, and wound problems. Specific complications for arthroplasty include dislocation, loosening, wear, leg length discrepancy,

and peri-prosthetic fractures. For fixation devices, the recognized complications are failure of fixation or metalwork, avascular necrosis, and non-union.

Medical complications following a hip fracture present a significant problem. Early recognition and intervention of medical complications are imperative to reduce associated mortality. Below is a list of common medical complications following hip fracture along with their estimated prevalence[51]:

Delirium: 13.5% to 33%

Pulmonary embolism: 1.4% to 7.5%

Deep venous thrombosis: 27%

Pneumonia: 7%

Myocardial infarction or heart failure: 35% to 42%

Urinary retention or infection: 12% to 61%

Acute kidney injury: 11%

Anemia: 24% to 44%

Skin pressure damage: 7% to 9%

Postoperative and Rehabilitation Care

Pharmacological venous thromboembolism prophylaxis is recommended during the postoperative period providing there are no contraindications. Postoperative blood transfusion is only recommended if the hemoglobin is below 8 g/dL or the patient is symptomatic with their anemia.[18]

The postoperative rehabilitation is as important as the initial surgery. The aim of the surgery is to restore mobility, and therefore early mobilization should be commenced. Patients who have undergone arthroplasty or

fixation of an extracapsular fracture can usually mobilize immediately after surgery without weight restrictions. Following fixation of an intracapsular fracture protected weight bearing is often recommended to reduce the risk of subsequent fracture displacement.Regular intensive physiotherapy is required to encourage the rapid progression of mobility to restore the patient's original mobility status. Medical management must also be optimized to reduce the risk of associated complications. Unfortunately, many patients do not regain their previous level of mobility or independence and therefore require social care input.

Prognosis

Mortality rates are reported to be between 18% to 31% within 1 year of sustaining a hip fracture. Factors that increase mortality rates are age over 85, dependent functional status, ASA grade of 3 or more, male sex, previous history of cancer, and the development of a postoperative complication. Multiple outcome predication models exist and are validated for predicting both 30 day and 1-year mortality. In the UK, these risk stratification tools are used to identify high-risk patients whose operation should be performed or directly supervised by a senior surgeon.

Only 40% to 60% of patients regain their baseline mobility after a hip fracture, and 20% to 60% of previously independent people require assistance with at least one activity of daily living. Patients who live in a residential care home prior to their injury are less likely to recover their pre-injury function.[19]

Conclusion

In managing fractures in elderly patients, physicians must understand the nature of the injury, the potential impact on the patient's level of functioning, and the secondary impact on the patient's family. The primary goal of management is to return the patient to his or her level of function before the fracture. For most patients, this goal is best achieved by

operative management followed by early mobilization. A satisfactory outcome, however, depends on much more than treatment of the fracture. Physicians must recognize the complex problems associated with hip fractures and develop treatment plans that address all the factors that may affect the outcome. It is possible that new and better treatments for osteoporosis will result in a decreased incidence of hip fractures in the future. For now, however, we must address the epidemic of hip fractures with all our available expertise.

References

1.Cummings SR, Rubin SM, Black D. The future of hip fractures in the United States: numbers, costs, and potential effects of postmenopausal estrogen. Clin Orthop 1990;252:163-166

2.Cummings SR, Kelsey JL, Nevitt MC, O'Dowd KJ. Epidemiology of osteoporosis and osteoporotic fractures. Epidemiol Rev 1985;7:178-208

3.Barnes R, Brown JT, Garden RS, Nicoll EA. Subcapital fractures of the femur: a prospective review. J Bone Joint Surg Br 1976;58:2-24

4.Kyle RF, Gustilo RB, Premer RF. Analysis of six hundred and twenty-two intertrochanteric hip fractures: a retrospective study. J Bone Joint Surg Am 1979;61:216-221

5.Gallagher JC, Melton LJ, Riggs BL, Bergstrath E. Epidemiology of fractures of the proximal femur in Rochester, Minnesota. Clin Orthop 1980;150:163-171

6.Alffram P-A. An epidemiological study of cervical and trochanteric fractures of the femur in an urban population. Acta Orthop Scand Suppl 1964;65:1-109

7.Deandrea S,Lucenteforte E,Bravi F,Foschi R,La Vecchia C,Negri E, Risk factors for falls in community-dwelling older people: a systematic review and meta-analysis. Epidemiology (Cambridge, Mass.). 2010 Sep

8. Parker M,Johansen A, Hip fracture. BMJ (Clinical research ed.). 2006 Jul 1

9. Mosk CA,Mus M,Vroemen JP,van der Ploeg T,Vos DI,Elmans LH,van der Laan L, Dementia and delirium, the outcomes in elderly hip fracture patients. Clinical interventions in aging. 2017

10. Downie S,Joss J,Sripada S, A prospective cohort study investigating the use of a surgical planning tool to improve patient fasting times in orthopaedic trauma. The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland. 2019 Apr

11. Ylinenvaara SI,Elisson O,Berg K,Zdolsek JH,Krook H,Hahn RG, Preoperative urine-specific gravity and the incidence of complications after hip fracture surgery: A prospective, observational study. European journal of anaesthesiology. 2014 Feb

12. Smith I,Kranke P,Murat I,Smith A,O'Sullivan G,Søreide E,Spies C,in't Veld B, Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. European journal of anaesthesiology. 2011 Aug

13. Callear J,Shah K, Analgesia in hip fractures. Do fascia-iliac blocks make any difference? BMJ quality improvement reports. 2016

14. Eventov I, Moreno M, Geller E, Tardiman R, Salama R. Hip fractures in patients with Parkinson's syndrome. J Trauma 1983;23:98-101

15. Davis FM, Woolner DF, Frampton C, et al. Prospective, multi-center trial of mortality following general or spinal anaesthesia for hip fracture surgery in the elderly. Br J Anaesth 1987;59:1080-1088

16. Riis J, Lomholt B, Haxholdt O, et al. Immediate and long-term mental recovery from general versus epidural anaesthesia in elderly patients. Acta Anaesthesiol Scand 1983;27:44-49

17. Hedstrom SA, Lidgren L, Sernbo I, Torholm C, Onnerfalt R. Cefuroxime prophylaxis in trochanteric hip fracture operations. Acta Orthop Scand 1987;58:361-364

18. Carson JL,Terrin ML,Noveck H,Sanders DW,Chaitman BR,Rhoads GG,Nemo G,Dragert K,Beaupre L,Hildebrand K,Macaulay W,Lewis C,Cook DR,Dobbin G,Zakriya KJ,Apple FS,Horney RA,Magaziner J, Liberal or restrictive transfusion in high-risk patients after hip surgery. The New England journal of medicine. 2011 Dec 29

19. Dyer SM,Crotty M,Fairhall N,Magaziner J,Beaupre LA,Cameron ID,Sherrington C, A critical review of the long-term disability outcomes following hip fracture. BMC geriatrics. 2016 Sep 2