Improving Time to Surgery-
Emergency Room, Preoperative and Immediate Postoperative Clinical Practice Guidelines for the Management of Hip Fracture Patients

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Table of Contents

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In 2005, the Ministry of Health and Long term Care made a commitment to achieve 48 hours to surgery for hip fracture patients[1]. In April 2008, the Orthopaedic Expert Panel was given a mandate to assist organizations to implement a hip fracture strategy to improve the wait time from entry to the Emergency Room (ER) to accessing surgery within 48 hours. A Provincial Hip Fracture Model of Care was created (Appendix A) which flows patients across the health care continuum and provides best practice standardized guidelines for care across. Integrated into this model is the target for 90% of hip fracture patients to receive surgery within 48 hrs of ER admission. In April 2010, a group of physicians representing the emergency department, anesthesiology, internal medicine, and orthopaedic surgery came together to bring forward best ER, pre-operative and immediate post-operative clinical practice to support hospitals and clinicians in achieving timely surgery for hip fracture patients.

Access to Timely to Surgery within 48 hours

Access to timely surgery is crucial for patients following a hip fracture and is frequently linked to significantly higher rates of mortality, as well as, contributing to increased morbidity and subsequently reduced success in rehabilitation[2,3,4,5,6,7]. Studies have suggested that for each day surgery is delayed the odds of the patient dying in hospital is increased, and operative delays beyond 48 hours approximately double the risk of the patient dying before the end of the first postoperative year[2,7].

Many reasons exist for why patients may be delayed in accessing surgery. Some of these may be related to the patients pre-existing medical condition. In these cases the recent evidence needs to be carefully considered and balanced between the benefits of timely surgery and patient medical needs. However at the same time, many underlying and often correctable process issues exist and contribute to surgery delays including waits for consultations, lack of available surgical time, waits for bed availability, and inadequate access to the necessary resources for surgery[8].

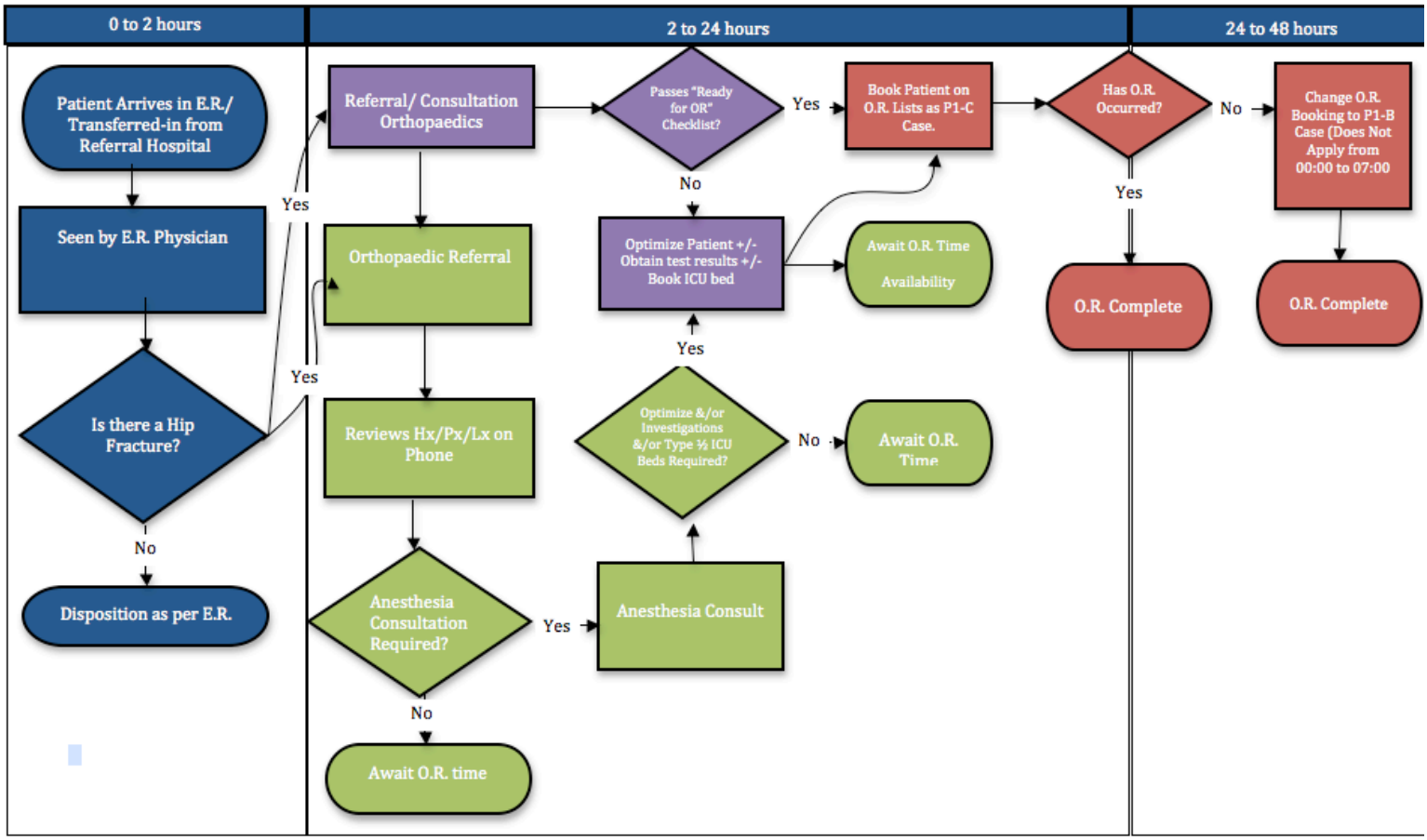
Delays to surgery for some medical conditions and for non-medical reasons are considered to be detrimental to patients following hip fracture. Therefore underlying process issues need to be resolved and a system must be developed to ensure timely access to surgery within a maximum of 48 hours for all patients who are medically stable.

Most hip fracture patients come by ambulance and enter the healthcare system (or hospital) through the emergency department. ER management to improve access to timely surgery for hip fracture patients includes streamlining their triage, assessment and diagnosis; immediate ER management; and pre-operative management to ensure medical stabilization for surgery. Most patients should be operated on as soon as possible and within 48 hours once entering the ER and the patient's condition has been stabilized appropriately[2,7]. Short delays may be justified to gain improvement in clinical condition, particularly the restoration of circulatory volume or for the correction of such conditions as hyperkalaemia, poorly controlled cardiac failure or diabetes, significant anemia, and for the investigation of cardiac murmurs. However, it is important not to pursue unrealistic medical goals with resulting delays. It is important to note that undue delay to surgery (> 48 h) in older patients using antiplatelet agents may be associated with higher morbidity, which may indirectly affect mortality[8].

Preoperative Pathway Algorithm

To achieve timely surgery within 48 hours, a preoperative pathway algorithm has been developed that delineates the steps and time frames necessary to flow the patient from entry into the ER to the surgery within the operating room. See *Figure 1*.

Figure 1. Preoperative pathway algorithm for hip fracture patients to achieve timely surgery within 48 hours.



Recommendations

The following recommendations are made on the management of hip fracture patients to expedite their care in the ER, through optimum ER Care, Preoperative Management, Anaesthesia Management, Surgical Management, Immediate Postoperative Management, and Process Management.

A. Emergency Room Care

1. Triage, Early Recognition, Assessment and Diagnosis

Hip fracture patients are often older people that often present with vague symptoms of a recent fall, not walking, weakness and/or pain. Early recognition of these patients with a potential hip fracture through presentations of a short and externally rotated leg is necessary and requires higher prioritizing within the triage category.

Emergency physician/health team assessment should occur within *one hour* of entry into the emergency department[8]. Order sets that include medical directives are useful to expedite diagnosis and treatment of patients with hip fractures and support nurses to initiate management of hydration and pain, as well as appropriate tests including bloodwork and x-ray. ER assessment should include:

- Reason for the fall (MI, PE, AAA, overdose, etc.)
- Fluid balance
- Pressure sore risk
- Hydration and nutrition
- Pain
- Temperature
- Other collateral injuries ie head injury, spinal injury, elder abuse etc.

Assessment and thorough documentation by the admitting physician/other (GEM Nurse) also needs to consider:

- Mechanism of Injury
- Previous mobility
- Previous functional ability
- Mental state based on pre-morbid functioning level
- Social circumstances
- Acute and chronic co morbid conditions and include current treatments.

Referrals for consultation will then involve the orthopaedic surgeon, and anesthesiology and/or internal medicine depending on the hospital. These referrals should then occur within *2 hours*. Patient review by the anaesthesiologist should determine the depth of investigations needed for safe perioperative care, and any necessary preoperative interventions (i.e. anticoagulation reversal). Appropriate investigation will be ordered and next steps determined.

In some situations, the patient will present to a referral hospital that does not provide the necessary orthopaedic surgery. Shared pre-operative approaches with the regional acute care centre will offer reductions in investigations and easier transfer for orthopaedic surgery. These patients should be admitted to the inpatient unit, medically stabilized and optimally managed while awaiting transfer to the regional hospitals for surgery.

1. Immediate Management Issues

a. Pain management

Standardized pain assessment tools should be used to assess a patient's level of discomfort[8,9,10]. The Visual Analog Scale and Faces Pain Scale are common assessment tools. Pain assessment includes reviewing a patient's pre-hospital pain medications.

Adequate pain management is essential for hip fracture patients and should be started as soon as possible. Most commonly, titration of intravenous opioids, such as morphine or hydromorphone are used for analgesia. Care should be taken when titrating opioids in opioid naive elderly patients. Multimodal analgesia – providing pain relief using more than one drug/approach, can provide better analgesia with fewer side effects. Often, analgesics such as acetaminophen, NSAIDs, etc. can be co-administered with opioids to enhance patient analgesia. Continuation of long-acting opioids for patients who have pre-existing chronic pain conditions should generally occur to ensure adequate analgesia and prevent withdrawal symptoms. Increased analgesia may be required prior to moving patients (ie. from stretcher to x-ray or bed).

A regional nerve block may be considered as an analgesia adjunct, especially for those who poorly tolerate systemic analgesics. The fascia iliaca compartment block has been shown to decrease pain in hip fracture patients, is simple to perform and requires minimal equipment.

Patients should be admitted promptly to an inpatient unit where pain management is part of their routine nursing care and can be delivered in a more predictable fashion.

b. Hydration

Hip fracture patients are frequently poorly hydrated on entry to the ER or may become poorly hydrated while waiting for surgery. At the same time, these patients may have difficulty coping with large volumes of parenteral fluid. Intravascular intervention and hydration should be assessed carefully and continuously[8].

c. Prevention of pressure sores

Hip fracture patients are at risk of pressure sores while awaiting surgery since they often are frail and have poor skin condition. Steps to prevent the development of pressure sores should be taken, and patients should be transferred to an appropriate hospital bed with a pressure-relieving mattress. Specifically consideration needs to be given to using soft surfaces to protect heels and the sacrum. Clinical judgment and identified assessment tools should be used to determine patients at risk. Those patients at very high risk of pressure sores should ideally be nursed on a large-cell, alternating-pressure air mattress or similar device[8,11,12].

d. *Nutritional status*

All patients should have a nutritional assessment, so that protein and energy supplements can be provided as needed. The use of protein and energy feeds may reduce "unfavourable outcome" (combined outcome of mortality and survivors with medical complications) however these may be considered as a light meal therefore the potential for the delay of surgery needs to be considered.

Fasting guidelines are used to decrease the risk of aspiration in patients undergoing anesthesia. The Canadian Anesthesiologists' Society for fasting are:
≥ 2 hours – Clear fluids
≥ 6 hours – Light meals (ie. toast, non-human milk)
≥ 8 hours – Heavy meals (ie. meat, fried or fatty foods)

e. Reducing the potential for delirium

Hip fracture patients are at high risk for delirium both pre and post operatively[13]. The prevention of delirium is the most effective strategy for reducing its frequency and complications and is

important to start in the Emergency Department. Delirium intervention protocols which have been found to reduce frequency and complications and should be implemented include:

- A review of risk factors,
- Assessment of symptoms using a delirium screening tool such as the Confusion Assessment Method,
- Assessment/management of underlying causes, and in particular effective pain management, and
- Prevention strategies targeted to;
    - Orientation,
    - Early mobilization,
    - Non-pharmacological approaches to minimize the use of psychoactive drugs,
    - Sleep hygiene,
    - Adaptive equipment for vision and hearing impairment, and
    - Early intervention for volume depletion[14].

Proactive approaches using geriatric principles and where necessary, geriatric consultation, may reduce incidence and severity of delirium in patients undergoing surgery for hip fracture[15,16]. The use of medication may be considered for some patients.

f. Osteoporosis management

Osteoporosis contributes significantly to the occurrence of a hip fracture[17,18]. The presence of a fragility fracture is a significant predictor in the occurrence of future fractures and about 50% of all those that survive the original fracture will experience a subsequent fracture within 10 years[19]. In spite of this evidence, it has been estimated that only a small number (5% to 25%) of patients with fragility fractures are investigated for osteoporosis, and only half of those receive treatment[20,21,22].

It is crucial that comprehensive interventions to prevent future fracture are initiated and become a routine part of hip fracture care without delay. In some organizations there is the opportunity to start the process through the ER [20,23,24]. If this is to be started in the Emergency Department a standing order set to be initiated in the ER is recommended to include complete blood count (CBC), Creatinine, Electrolytes, alanine aminotransferase (ALT), alkaline phosphatase, Calcium, Phosphorus, 25-OH vitamin D, and parathyroid hormone (PTH). Blood work initiation in the ER will allow adequate time for results and initiation of basic osteoporosis management by the orthopaedic surgeon while that patient receives care in the acute care unit[25]. If this is not initiated in the Emergency Department it should be initiated on admission to the unit either prior to or directly following surgery.

Osteoporosis treatment with calcium, vitamin D, and a bisphosphonate has been demonstrated to be effective in the prevention of future fractures in high risk patients like those with hip fracture[26-29]. Recently, orthopaedic surgeons have identified themselves as willing leaders in initiating basic osteoporosis management and referral for patients under their care who had experienced a fragility fracture[30].

g. Oxygen therapy

Persistent hypoxia may be present in hip fracture patients from the time of emergency admission to 48 h after surgery. Patients should have oximetry assessment, and oxygen administered as necessary [31,32].

h. Urinary catheterization

Avoid indwelling catheters (where possible). Hip fracture patients that are frail older people demonstrate a high incidence of urinary tract infections. Intermittent catheterization is preferable and has been shown not to increase the incidence of urinary tract infections[33].

i. Prophylactic antibiotics

Hip fracture patients are at risk of chest, urinary tract and wound infections. The administration of prophylactic intravenous antibiotics should be given as a single dose at the induction of

anaesthesia. Prolonged antibiotic use is of no proven benefit for prophylaxis of wound infection [34], therefore initiation of antibiotic therapy is not recommended in the ER for hip fracture patients.

j. Preoperative traction

The practice of pre-operative traction was intended to relieve pain and make subsequent surgery easier. Current evidence does not support the routine use of preoperative traction and the practice should be abandoned [35,36,37].

k. Pressure gradient stocking

There is no strong evidence to support the use of pressure gradient stockings for hip fracture patients, and when used, they may delay the institution of effective prophylaxis[38,39] . Pressure gradient stockings contribute to skin ulcers. Proper measurement and compliance with their use is poor, and they are an added unnecessary cost.

B. Preoperative Management

1. Management of Anticoagulation

Considerable controversy exists with regard to the use of thromboprophylaxis prior to surgery. While it is recognized that immobilization secondary to hip fracture is conducive to the development of deep vein thrombosis, it is also recognized that neuraxial anaesthesia may be preferable in the majority of these patients but may be contraindicated in patients receiving anticoagulation preoperatively.

This dilemma is one of the most convincing reasons for early surgery in this patient cohort - the earlier the patient is taken to the operating room and the fracture stabilized, the sooner the patient can be mobilized thereby decreasing the incidence of deep vein thrombosis. Appropriate discontinuation of anticoagulation prior to surgery offers opportunities for optimal care by allowing the choice between general anaesthesia and neuraxial anaesthesia (ie. spinal or epidural). Most anaesthesiologists refer to the American Society of Regional Anaesthesia consensus statement[40] regarding regional anaesthesia and anticoagulation therapy. The most recent version can be found at www.asra.com. Regional anaesthesia may be contraindicated in patients who receive:

LMWH (prophylactic dose):	less than 10-12 hours prior
LMWH (treatment dose):	less than 24 hours prior
Warfarin (Coumadin):	less than 4 days prior and have an INR > 1.5
Clopidogrel (Plavix):	less than 7 days prior
Ticlopidine:	less than 14 days prior

a. Management of patients on clopidogrel (plavix)

Hip fracture patients are often older persons that may present with co-morbidities that may require them to be taking clopidogrel. Clopidogrel was originally designed and introduced as a drug for stroke prevention, and more recently has become widely used for patients who have undergone coronary artery stenting procedures. It is important to ascertain the indication for clopidogrel, and cardiology consultation is highly recommended for patients with coronary stenting prior to clopidogrel discontinuation, to avoid in-stent thrombosis.

Because of the need for surgical repair within 48 hrs, hip fracture patients on clopidogrel will still have clinically significant antiplatelet activity at the time of surgery. Current literature indicates that there are no serious surgical complications or increased transfusion requirements for patients on clopidogrel. The goal for patients on clopidogrel should still be early operative intervention to decrease morbidity and mortality associated with surgical delay for hip fracture patients[41].

b. Management of patients on warfarin (coumadin)

Long-term anticoagulation treatment with warfarin has become more prevalent in a variety of conditions such as atrial fibrillation, prosthetic heart valves, acute venous thromboembolism and transient ischaemic episodes. These conditions most commonly occur amongst older people who are over the age of 65[42], and since hip fracture is also prevalent amongst this population, warfarin management has implications for orthopaedics. First-line therapy for the reversal of warfarin anticoagulation is Vitamin K. For surgery greater than six hours away, administration of intravenous Vitamin K (5-10mg) should be sufficient for reversal[43]. If more urgent reversal is required (less than six hours), compounds such as prothrombin complex concentrate (PCC) (ie. Octaplex®) or frozen plasma (FP) may be considered along with the use of intravenous Vitamin K. PCC is probably the preferred choice over FP for those at risk for volume overload[44].

2. Assessment of LV function and Significant Valvulopathies

Consultants are often asked to "clear" the patient for surgery, or more specifically, address cardiac risk evaluation. This is achieved through clinical risk scoring as well as potentially ordering further non-invasive cardiac testing, such as echocardiography to determine left ventricular function, or rule out aortic stenosis, or cardiac stress testing to determine the presence of reversible ischemia. Cardiac testing will seldom delay surgical intervention in the elective surgical patient, but it has been found to delay time to surgery in hip fracture patients. In one study, patients who had cardiac testing waited an average of 3.3 days compared to 1.9 days among those who did not (1.9 days), (P<.001)[45]. Surgery delay secondary to cardiac clearance may be a risk factor for increased postoperative complications that is independent of a patient's general medical condition[46] Due to the increased risk to patients of delays in hip fracture repair, the consultant and surgeon should give careful consideration as to whether there will be a change in management, and more importantly, and improvement in outcomes as a result of further testing. One study of 235 consecutive patients over the age of 60 treated for a hip fracture showed that 35 (15%) had cardiac testing prior to treatment of their hip fracture. No patient underwent cardiac surgery or coronary angioplasty as a result of the testing. In 48% of cases, cardiac testing did not lead to new medical treatment. In 52%, recommendations were only made for medical management of previously known cardiac disease. The cost of preoperative cardiac testing totaled more than $44,000 for the 35 patients[45].

Severe aortic stenosis is often cited as an important risk factor for cardiac outcomes after surgery and an important disease state to rule out. In the event that the patient has a systolic ejection murmur, simple physical examination techniques are of proven accuracy in determining severity of cardiac outflow obstruction. The absence of a murmur over the right clavicle has been found to effectively rule out aortic stenosis (likelihood ratio [LR] 0.10; 95% confidence interval [CI] 0.01, 0.44), while the presence of three or four associated findings (slow carotid artery upstroke, reduced carotid artery volume, maximal murmur intensity at the second right intercostal space, and reduced intensity of the second heart sound) ruled in aortic stenosis (LR 40; 95% CI 6.6, 240)[47]. In the event that the findings are positive, or indeterminate, consideration of echocardiography may be appropriate.

The other main indication for transesophageal echocardiography prior to hip fracture surgery is for the evaluation of left ventricular function. The 2009 ACCF/AHA Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery Recommendations for Preoperative

Noninvasive Evaluation of LV Function state that it is reasonable for patients with dyspnea who have a current or prior heart failure, or dyspnea of unknown origin, to undergo preoperative evaluation of LV function[48]. The evidence that supports this recommendation is of low quality and has not specifically addressed the question of whether non-invasive evaluation of left ventricular function prior to hip fracture repair improves outcomes. One large study found that any degree of LV systolic dysfunction was only marginally associated with postoperative myocardial infarction or cardiogenic pulmonary edema (OR 2.1, 95% CI 1.0 to 4.5; p=0.05)[49].

C. Anaesthesia Management

1. Types of Intra-operative Anaesthesia – Neuraxial vs. General Anaesthesia

A recent comprehensive systematic review by the Cochrane database group[50] showed decreased post-operative confusion when using regional anaesthesia. There are also other reported benefits of regional anaesthesia, such as decreased thromboembolism development, decreased intraoperative blood loss, and decreased short-term mortality, however, insufficient large-scale, multi-study data exists to make definitive conclusions.

Common North American neuraxial regional anaesthesia techniques include single-injection spinal (intrathecal) anaesthesia, epidural catheter anaesthesia and combined spinal-epidural (CSE) anaesthesia. The type chosen depends on expected surgical complexity and duration of surgery, as well as co-existing patient factors. Often, intravenous sedation is co-administered during the operation to enhance patient comfort.

There are many reasons which preclude the use of neuraxial anaesthesia, such as anticoagulation, patient refusal, challenging anatomy, etc, thus requiring general anaesthesia. Ultimately, the choice of anaesthesia administered rests in the hands of the attending anaesthesiologist.

2. Post-operative Pain Management

Systemic opioids (ie. morphine) are the most common form of post-operative analgesia for hip fracture. Common side-effects include sedation, respiratory depression, confusion, nausea, pruritus, and constipation. These effects can be more pronounced in the elderly population, in which hip fractures are more common. Nurse administered opioids via intravenous, subcutaneous, and oral routes are most often seen, but patient-controlled anaesthesia (PCA) devices are increasingly available. PCA devices allow patients to self-administer intravenous opioids according to timed dose parameters set by a physician. This allows the patient to self-titrate the medication to an optimal dose, maximizing analgesia while minimizing side-effects. However, the patient must be able to cognitively understand and use the PCA device. As mentioned previously, multimodal analgesia can enhance pain relief, while minimizing side effects.

In certain cases, continuous regional anaesthesia (ie. epidural) can be considered for post-operative analgesia. Post-operative epidural analgesia requires specific daily assessments and potential alterations in post-operative anticoagulation. Some anaesthesiologists abstain from the concurrent use of systemic opioids and intrathecal/epidural long acting opioids (ie. morphine) because of the increased risk of respiratory depression.

D. Surgical Management

1. Considerations in Types of Surgery

Hip fractures demand a thoughtful, individualized approach for optimal results to be achieved. Careful pre-operative planning must consider the level of patient demand and co-morbidity as well as the specifics of the fracture pattern and associated injuries or pre-existing musculoskeletal problems. Surgical tactics should be chosen that achieve maximal functional results while balancing the risk of implant failure, malunion, and surgical morbidity for the particular patient[51]. A variety of surgical strategies are outlined in Appendix B.

2. Immediate weight bearing

Immediate weight bearing for previously ambulatory hip fracture patients is of paramount importance in improving patient mortality and morbidity, reducing medical complications, minimizing hospital length of stay and most importantly improving functional outcome and the likelihood of future independent living [52-60]. Previously, very real concerns existed whereby early ambulation and weight bearing could lead to implant failure, malunion or nonunion[51]. However, recent advances in modern technology and implants allow for stable fixation, or replacement arthroplasty, in all cases of hip fracture, including those previously considered biomechanically "unstable" after surgery with older implants such as the sliding hip screw[61-65]. Also, studies indicate that patients limit their weight bearing dependant on the stability of the construct and failure rates have not increased[59,60,66,67]. Immediate weight bearing should be applied to all patients after hip fracture surgery. For further discussion see Appendix B.

Immediate Postoperative Care

1. Clinical Pathway

Clinical pathways help to support the standardization of care across the healthcare continuum. These guidelines identify the activities needed to assist patients through to their recovery by providing a sequence and timing of interventions to meet the patient's discharge goals in an efficient timeframe. These maps should be multidisciplinary in nature and help to coordinate the activities of the care team including physicians, nurses, and other staff involved in providing care for patients[68]. Clinical pathways have been effectively used pre-operatively, as well as postoperatively during both the acute and rehabilitation phases of recovery[69]. An example of an acute care clinical pathway is available in Appendix C.

2. Delirium, Dementia and Depression (3D's) Screening and Management

Hip fracture patients are older people whereby their complex and multi-faceted nature contribute to delirium, dementia and depression conditions being unrecognized, occurring frequently, and often being poorly managed[13]. Management of these challenging issues requires a multidisciplinary approach that includes targeted nursing and rehabilitation assessment and interventions to manage cognitive issues on a daily basis, and in severe cases, pharmacological management through either the surgeon or another physician.

Delirium intervention protocols which have been found to reduce frequency and complications and should be implemented include:

- A review of risk factors,
- Assessment of symptoms using a delirium screening tool such as the Confusion Assessment Method,

- Assessment/management of underlying causes, and in particular effective pain management, and
- Prevention strategies targeted to;
    - Orientation,
    - Early mobilization,
    - Non-pharmacological approaches to minimize the use of psychoactive drugs,
    - Sleep hygiene,
    - Adaptive equipment for vision and hearing impairment, and
    - Early intervention for volume depletion[14].

Proactive approaches using geriatric principles, and where necessary, geriatric consultation, may reduce incidence and severity of delirium in patients following hip fracture surgery[15,16]. The use of medication may be considered for some patients.

3. Thromboprophylaxis/ Anticoagulation

The use of thromboprophylaxis in hip fracture patients is well recognized. Following surgery, hip fracture patients should receive routine anticoagulation as per the CHEST guidelines[38]. Low molecular weight heparin is effective in the prevention of deep vein thrombosis and should be used routinely after surgery. If the patient has a nerve block catheter insitu (ie. epidural catheter), the anaesthesiologist should be made aware prior to initiation of anticoagulation.

Mechanical devices should be restricted to patients where chemical anticoagulation is contraindicated. Antithrombotic stockings have not been proven to be efficacious in the prevention of deep vein thrombosis; if mechanical prophylaxis is necessary, intermittent pneumatic compression devices should be utilized[39].

3. Rehabilitation and Early Mobilization

Rehabilitation and early mobilization through a coordinated multidisciplinary program are key to regaining sufficient function for patients to return to their re-fracture living situation in the community[11,69,70]. Patients should start their rehabilitation through early mobilization within the first 24 hours after surgery[11]. This prevents the onset of potential medical issues including skin issues, and cardiovascular, respiratory and gastrointestinal complications, as well as the onset of delirium - a common condition occurring post surgery in hip fracture patients. Rehabilitation should focus on addressing physical and functional needs of the patient, and include transfer techniques, balance, and gait training [52,54,71]. These are important components of mobility and predictors of functional independence and increased functional tolerances at two months [52].

F. Process management

There are a number of system factors that can lead to difficulties in patients accessing the Operating Rooms. There recommendations below provide an overview of some of the strategies that are being used within health care organizations across Ontario to facilitate access.

1. Operating Room Booking Priority Policy

Hip fracture patients access to the operating room usually begins at a priority type C and as such they should be designated to access surgery within 48 hours. In organizations where there are a high volumes of other patients already designated as priority type B hip fracture patients regularly do not receive surgery within this 48 hour timeframe. In these cases changing the Operating Room Booking Policy to upgrade hip fracture patients from priority type C to priority type B after 24 hours on the operating room wait list has been effective in increasing access to care.

2. Trauma Time

Sufficient operating room time is required to successfully manage trauma patients such as those with a hip fracture. Designated orthopaedic trauma operating room time is a method to increase access to timely surgery. This designated time needs to available at regular intervals each week, such as daily or 3 times weekly, to manage the hip fracture patients within the 48 hour timeframe.

3. Regional Trauma Planning

Where patients are taken to an Emergency Room where there are no or limited orthopaedic services available, the development of a regional trauma plan is recommended. A regional trauma plan is a written agreement between health care organizations that includes clear expectations for timely acceptance for transfer of the patient for surgery, shared pre-operative approaches, and timely repatriation of the patient back to the referral hospital for continued care. Memorandums of agreement and defined policies between hospitals are required.

4. Fast Tracking to Inpatient Unit within 4 hours

Evidence suggests that fast tracking from the ER to the inpatient unit is a good standard of clinical care for older people with hip fracture and contributes to improved pressure care[8].

5. Early Referral and Transfer to Home or Rehabilitation on Day 5 Postoperatively

Patients that experience a hip fracture and who were living successfully in the community should have the opportunity to return home again through early transition either home or to inpatient rehabilitation by Day 5 postoperatively [8,69]. There is a misconception that since these patients are older and frail, and may have cognitive issues experienced as delirium, dementia and depression such that they are unable to benefit from rehabilitation approaches[72,73]. A large body of research indicates these patients benefit from targeted and structured rehabilitation that is offered through an interprofessional team and aimed at improved self-care and motor function[72-79]. The GTA Rehab Network[80] outlines the following criteria for determining if a patient is a candidate for rehabilitation including:

1. Patient demonstrates by documented progress the potential to return to premorbid/ baseline functioning or to increase in functional level with participation in rehab program.
2. Clinical expertise and evidence in the literature indicates the patient's condition is likely to benefit from the rehab program/service,
3. Goals for rehabilitation have been established and are specific, measurable, realistic and timely,
4. Patient or substitute decision-maker has consented to treatment in the program and demonstrates willingness and motivation to participate in the rehab

In order to achieve early transition to rehabilitation by Day 5 postoperatively as outlined in the Provincial Hip Fracture Model Care, referral to rehabilitation needs to occur on Day 2 - 3 of the clinical pathway, and in anticipation of the patient being medically stable by Day 5 and ready for transition to rehabilitation[80].

6. Standardized Discharge Planning

Discharge planning requires effective, efficient and consistent processes, and is the responsibility of all members in an interprofessional team[8,69]. Discharge planning starts with the initial assessment on the patient's arrival in the emergency department[8]. The patient and family should be fully informed about the care plan and including expectations for targeted lengths of hospital stay in acute care and for transitions to rehabilitation[81]. Potential discharge issues should be identified early in the process and this will enable maximum time to make preparations for a home

supported discharge. Also, for the few patients identified as unable to return to their pre-fracture setting there will be the opportunity to make an alternate arrangement for placement[8].

Prior to a patient's discharge from hospital, services need to be coordinated in the community and sufficient notice must be given to allow patients and care givers time to make arrangements and setup the care for the patients return home. Educational information on medication, mobility, expected progress, and pain control should be given to the patient, care giver and families. A schedule of appointments, as well as, relevant contact information needs to also be provided to ensure patients and caregivers are able to access the necessary ongoing care[8]. The family physician or community care provider should be informed about the pending discharge and a follow-up appointment made within 2 weeks of discharge.

Quick Reference Guide

A Quick Reference Guide, Improving Time to Surgery-Emergency Room, Preoperative and Immediate Postoperative Clinical Practice Guidelines for Hip Fracture Patient Management, has been developed to provide health care professionals with a summary of the most important recommendations. See Appendix D.

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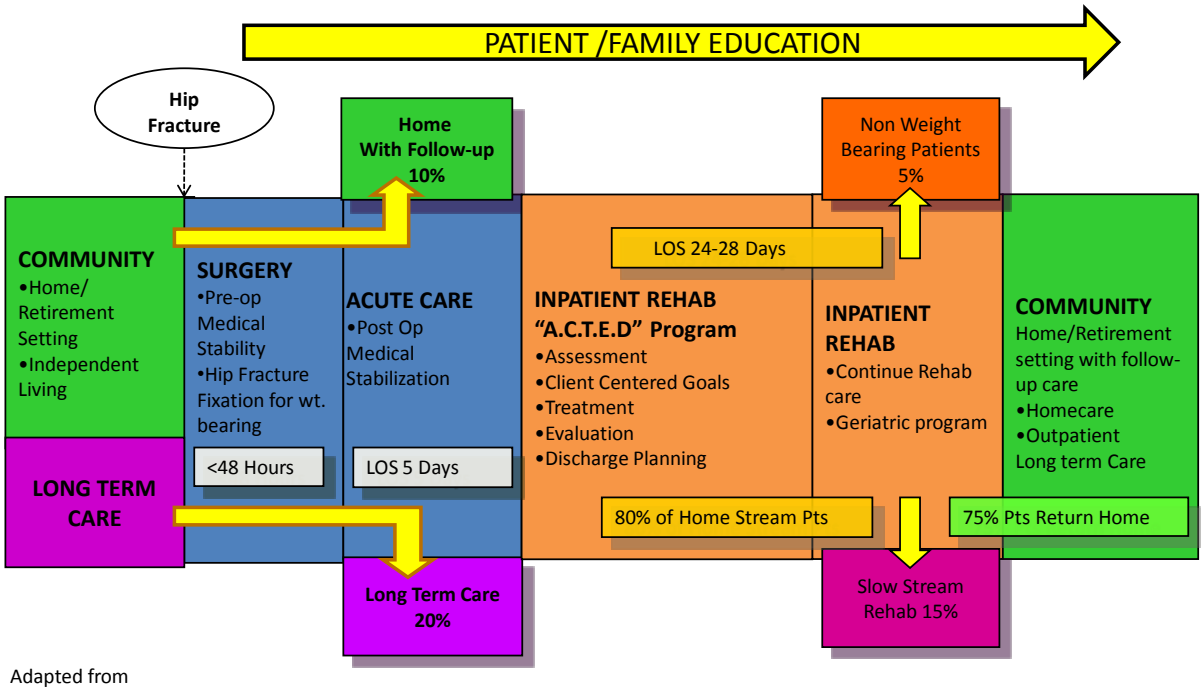
Appendix A

Provincial Hip Fracture Model of Care

The Provincial Hip Fracture Model of Care and Toolkit promotes optimal care for patients and efficient patient flow across the health care continuum. The primary outcome is to return a patient to their pre-fracture setting, for most this is home, or to ensure their transition into the most appropriate care setting. Key elements of the model include reduced surgery wait times of 48 hours or less, early mobilization post surgery, and new and earlier access at Day 5 postoperatively to inpatient rehabilitation for all medically stable patients coming from the community regardless of cognitive impairment. Patients have new access to the rehabilitation that they have previously been denied, and for most patients, this means new opportunities to return home. A Toolkit has been developed to support the changes in clinical practice and offers standardized clinical pathways; considerations for surgical management to optimize functioning; delirium, dementia and depression protocols; best practice in secondary prevention management for osteoporosis management and falls risk/reduction; and performance measurement tools to monitor patient access and flow across the healthcare system using pre-defined targets.



Adapted from
Mahomed et al., 2008; McGilton et al., 2009; Scottish Intercollegiate Guidelines Network , 2002; British Orthopaedic Association, 2007

Appendix B

Improving Functional Recovery After Hip Fracture Surgery

Hans J Kreder MD, MPH, FRCS(C)

Immediate Weight Bearing Improves Outcome

It has long been accepted that early mobilization of elderly patients, including those with hip fractures, is critical to avoiding medical problems such as skin, cardiovascular, respiratory and gastrointestinal complications (Koval & Zuckerman, 1997). Moreover immediate weight bearing after hip fracture surgery has been shown to decrease medical complications (Kamel, Iqbal, Mogallapu, Maas & Hoffmann, 2003), decrease mortality (Siu et al., 2006), improve functional recovery (Ammann, 2007; Kamel et al., 2003; Oldmeadow et al., 2006; Portegijs et al., 2008; Sherrington, Lord & Herbert, 2003Sherrington, Lord & Herbert, 2004; Siu et al., 2006), and accelerate discharge from the acute care hospital (Oldmeadow et al., 2006; Rasmussen, Kristensen, Foldager, Myhrmann & Kehlet, 2002).

Immediate Weight Bearing Is Safe

Immediate weight bearing should be applied in all cases after hip fracture surgery to achieve the benefits noted above. In the past, there was concern that early ambulation and weight bearing might lead to implant failure, malunion or nonunion in patients with unstable fracture patterns that had been tenuously fixed. In modern hip fracture care this is no longer an issue for the following reasons:

1. Patients limit the amount of weight placed through the operated limb depending on the stability of the construct (Koval, Sala, Kummer & Zuckerman, 1998), and failure rates are not increased with an immediate weight bearing protocol even in unstable fracture patterns with traditional implants (Koval, Friend, Aharonoff & Zukerman, 1996; Sherrington et al., 2003Sherrington et al., 2004).
2. Modern technology and implants allow for stable fixation, or replacement arthroplasty, in all cases of proximal femur fracture, including those previously considered biomechanically “unstable” after surgery with older implants such as the sliding hip screw (Geiger, Zimmermann-Stenzel, Heisel, Lehner & Daecke, 2007; Haentjens & Lamraski, 2005; Kakar et al., 2007; Kayali, Agus, Ozluk & Sanli, 2006; Parker, 2001; Weise & Schwab, 2001).

There is no longer any reason for hip fracture patients to be subjected to limited weight bearing after hip fracture surgery.

Surgical Strategies

Intracapsular Hip Fractures

Failure rates of surgically fixed intracapsular fractures increases progressively from approximately 6 percent in patients in their 40s to 25 percent in patients over age 70 (Parker, Raghavan & Gurusamy, 2007). Varus malunion and shortening of the femoral neck are associated with inferior functional outcome in all age groups after fixation of intracapsular hip fractures (Zlowodzki et al., 2008). Bone augmentation with calcium phosphate bone substitutes has NOT been shown to improve failure rates for intracapsular fractures (Mattsson & Larsson, 2006). A number of high quality randomized trials have suggested that replacement arthroplasty produces better results than fracture fixation in elderly patients with subcapital hip fractures (Blomfeldt et al., 2007; Frihagen, Nordsletten & Madsen, 2007; Parker & Gurusamy, 2006). Moreover replacement arthroplasty for intracapsular fractures that have failed after primary fixation is less successful than primary arthroplasty (Frihagen et al., 2007). For these reasons, the trend has been for an increasing number of these fractures to be treated with replacement arthroplasty in recent years, especially in elderly patients (Dimon & Laursen, 2008). Whether primary fixation or primary replacement arthroplasty is chosen (both cemented and uncemented), the post operative rehabilitation should involve full weight bearing immediately.

Extracapsular Fractures

Overview

There is considerable variation in the surgical repair of extracapsular hip fractures worldwide (Forte et al., 2008). The literature concerning these injuries must be interpreted with caution as groups of different fracture types are often analysed together, especially in comprehensive literature reviews (Parker & Handoll, 2008). One must consider the specific fracture pattern and location (base of neck, pertrochanteric, reverse obliquity or subtrochanteric) and the degree of metaphyseal comminution (Kregor, Obremskey, Kreder, Swiontkowski & Evidence-Based Orthopaedic Trauma Working Group, 2005). This requires careful preoperative evaluation of the radiographs (Koval, Oh & Egol, 2008) and thoughtful planning of the surgical tactic.

Bone augmentation with calcium phosphate for fractures in the trochanteric region has been shown to decrease hardware failure in biomechanical studies (Elder et al., 2000; Stankewich, Swiontkowski, Tencer, Yetkinler & Poser, 1996; Yetkinler et al., 2002), and has also been associated clinically with less fracture displacement (Mattsson & Larsson, 2004) and with a modest improvement in functional outcome (Mattsson et al., 2005). In select cases with marked osteopenia, bone augmentation with calcium phosphate substitutes may be considered.

Pertrochanteric Fractures

For pertrochanteric fractures that have a stable lateral cortex and little metaphyseal comminution both extra-medullary devices (such as the sliding hip screw), and intra-

medullary devices (cephalomedullary nails) provide reliable union rates and similar failure rates. Given that extramedullary devices tend to be less expensive, they are preferred for fixation of this fracture type (Parker & Handoll, 2008). Good surgical technique, including precise lag screw placement close to the subchondral bone in the centre of the femoral head are key to successful union without implant failure (Baumgaertner & Solberg, 1997).

Reverse Obliquity Fractures

For these injuries an intramedullary device or other alternative should be considered because the sliding hip screw is associated with a very high failure rate (Kregor et al., 2005).

Simple Metaphyseal Pattern

Lack of lateral support in the reverse obliquity fracture pattern often leads to severe shaft medialisation, even if there is little metaphyseal comminution since there is nothing to prevent the proximal fragment from sliding laterally. Medialisation can result in stabilization of the fracture fragments and may result in union, but the resulting malunion can be severe. We have little information regarding the functional consequences of severe malunion in the intertrochanteric region, but extrapolating from information regarding intracapsular fracture malunion would suggest that function is compromised by the shortened femoral neck and overall femoral shortening (Zlowodzki et al., 2008). Intramedullary nailing has become popular in these fracture patterns as a method of preventing shortening and malunion, while still achieving reliable bone healing (Platzer, Thalhammer, Wozasek & Vécsei, 2008). Alternatives include extramedullary devices with a trochanteric side plate to limit shaft medialization or a 95 degree angle device, although the 95 degree devices are also associated with a significant failure rate (Kregor et al., 2005).

Comminuted Metaphyseal Pattern

When there is extensive comminution of the metaphyseal region, the failure rate of standard extramedullary devices, such as the sliding hip screw, is even higher because both shaft medialisation and varus collapse (due to lack of medial support) may occur. Extramedullary devices that allow sliding both along the femoral neck and also axially along the shaft may reduce nonunion and implant failure, but at the expense of shortening of the femoral neck and shaft (Miedel, Ponzer, Törnkvist, Söderqvist & Tidermark, 2005). Intramedullary devices (especially long nails) provide a long working length to avoid stress concentration at the comminuted fracture site and also minimize shaft medialisation in these fracture types (Parker & Handoll, 2008; Platzer et al., 2008; Stern, 2007). Given the importance of immediate post-operative mobility, the surgeon should select a fixation strategy that makes them feel confident enough in the fixation to allow immediate full weight bearing.

Subtrochanteric Fractures

The key to successful treatment of subtrochanteric fractures is to avoid stress concentration, especially with simple fracture patterns (spiral, short oblique or transverse). Long intramedullary devices provide a long working length (the span

between proximal and distal locking screws) by design and thus avoid stress concentration. Plating simple fracture patterns demands one of two strategies:

1. Anatomic reduction of the simple fracture pattern with absolute stability (lag screw and compression plating) techniques.
2. Bridge plating with a long working length (leaving a long span without screw fixation) to avoid stress concentration.

Careful attention to technical detail is essential to avoid varus collapse, nonunion and plate failure. Counter-intuitively, plating of a subtrochanteric fracture with an extensive length of fracture comminution is technically easier as simple submuscular bridge plating techniques can be used to span the comminuted segment (Lee et al., 2007).

Nailing also demands careful attention to detail to avoid malpositioning the proximal fragment relative to the shaft, especially on the lateral view (Jiang, Shen & Dai, 2007; Saarenpää, Heikkinen & Jalovaara, 2007; Shukla et al., 2007). This is because the proximal fragment is often flexed relative to the shaft due to residual muscle attachment of the hip flexors. Nailing in the lateral position with the leg draped free on a radiolucent table often facilitates positioning the distal shaft to match the proximal deformity.

Special Cases

In some cases, the proximal femur is highly fragmented in both the base of neck area and the trochanteric area making it difficult or impossible to avoid malunion, femoral neck shortening, and trochanteric malposition with conventional extramedullary or even intramedullary devices. Use of proximal femoral locking plates can produce anatomic reduction in these fractures but careful attention to detail must be observed to avoid nonunion and ultimately, implant failure. Specifically, care must be taken to achieve compression across the femoral neck fracture to avoid stress concentration in this area. Stress concentration must also be avoided in the metaphyseal region. Because of the difficulty in avoiding complications with fracture fixation in these situations, replacement arthroplasty might be appropriate in select cases (Geiger et al., 2007; Haentjens & Lamraski, 2005; Kayali et al., 2006; Parker & Handoll, 2006; Stern, 2007). Although technically challenging, and associated with a higher risk of morbidity compared with routine total hip arthroplasty, it may provide the best chance of providing immediate mobility and good function for patients with these difficult fracture patterns (Lyman, Kelley & Lachiewicz, 2004).

Summary

Proximal femoral fractures demand a thoughtful, individualized approach for optimal results to be achieved. Careful pre-operative planning must consider the level of patient demand and comorbidity as well as the specifics of the fracture pattern and associated injuries or pre-existing musculoskeletal problems. A surgical tactic should be chosen that achieves maximal functional results while balancing the risk of implant failure, malunion, and surgical morbidity for the particular patient. Immediate weight bearing for previously ambulatory patients is of paramount importance in minimizing hospital length of stay and patient morbidity and mortality. Immediate weight bearing also maximizes functional outcome and the likelihood of independent living. The surgeon should keep

this in mind when formulating a pre-operative plan. Standardized post-operative orders should include "weight bearing as tolerated" routinely.

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Appendix C

BONE & JOINT HEALTH NETWORK

Acute Care Hip Fracture Clinical Pathway

Procedure: □HF SIDE: □RIGHT □LEFT DISCHARGE DESTINATION: □INPATIENT REHAB □HOME □LTC

Date: _____	**Preoperative** **TARGET DISCHARGE DATE_____** (Emergency or Inpatient)

	Interventions	Outcomes
1. Assessment	Preadmission assessment completed Consult: anesthesia and/or internal medicine (as per protocol to consider co morbidities/ need for epidural) Skin assessment completed Falls assessment completed	□____ □____ □____ □____
2. Prevention & Screening for Delirium, Dementia & Depression	Document Baseline Functioning & Mental Status – hx of previous delirium, dementia and/or depression Consider risk for delirium and referral for geriatric/internal medicine consultation Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids	□____ □____ □____
3.Tests	Blood work (as per protocol, if existing delirium or high risk of delirium include B12, TSH, CBC, GBCL, Liver profile) X-ray of index joint (as per protocol) Chest x-ray (as per protocol) ECG (age >45 or as per protocol)	□____ □____ □____ □____
3. Treatments	Foot booties applied as per protocol	□____
4. Medication	*Obtain medication profile* Pre op pain management (as per protocol) Ed: post op pain management (as per protocol)___pt ___family Ed: post op DVT prophylaxis (as per protocol) Ed: antibiotic prophylaxis (as per protocol)	□____ □____ □____ *verbalize understanding* □____ verbalize understanding □____ verbalize understanding
5.Osteoporsis Strategy	Initiate Hip Fracture Osteoporosis (OP) Standing Orders Tests- CBC, Creatinine, Electrolytes, ALT, Alk Phos, Calcium, Phosphorus, 25 OH Vitamin D, PTH	□____ □_____
6. Fluid Nutrition Elimination	Breakfast – clear fluids, high protein drink NPO status IV when NPO as per protocol Ed: post op bowel routine (as per protocol)	□____ □____ *verbalize understanding* □____ □____ verbalize understanding
7. Activity / Mobility	Bedrest Ed: Post op PT protocols	□____ □____ verbalize understanding

	Interventions	Outcomes
8. Client / Family Perspective	*Ed: Overall clinical pathway* Provide education materials – Hip Fracture Pamphlet Ed: Hip Precautions Ed: Discharge destination home/inpt rehab/LTC– Inpt Rehab Program Pamphlet Concerns / questions addressed	☐____ verbalize understanding ☐____ ☐____verbalizes understanding ☐____ verbalize understanding ☐____ comfortable with process
8. Discharge Planning	Consult Social Work r/e discharge planning	☐____ ____ home ____inpt rehab ___LTC

Date: _____ Arrived on unit _____ hr	**Day of Surgery - PACU**	**Day - 0**

	Interventions	Outcomes
1. Assessment	Assessment of VS, level of consciousness / airway, SaO_2, CSM/Pedal Pulses, Dressings	☐____ stable upon transfer to unit ☐____ dry and intact
2. Prevention & Screening for Delirium, Dementia & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids	☐____
3. Tests	Blood work: CBC (if requested) X-ray: AP hip (as per protocol)	☐____ ☐____
4. Treatments	*O_2 to keep SaO_2 > 94%* Blood transfusion if required	☐____ ☐____
5. Medication	Post op pain management (as per protocol)	☐____ *pain 3- 4/10 or manageable*
6. Fluid Nutrition Elimination	NPO (sips of water) IV fluids as per protocol Monitor urine output If OR cancelled, resume previous diet	☐____ ☐____ hemodynamic stable ☐____ call MD if output <30ml/hr ☐____
7. Activity / Mobility	Deep Breathing	☐____
8. Client / Family Perspective	Family informed of patients status	☐____
9. Discharge Planning	Patient transferred to unit when stable	☐____

Date: _____ Arrived on unit _____ hr	**Day of Surgery – Inpatient Unit Day - 0**

	Interventions	Outcomes
1. Assessment	Assessment as per protocol: VS / LOC eg. q1h x 4, then q4h if stable CSM eg. q1h x4 then q8h SaO_2 eg. q1h x 4 then q4h Dressings assess q4h Pain assessment q4h and prn Assessment of output from wound drain (if applicable)	☐____ ☐____ stable ☐____ stable ☐____ stable ☐____ dressings intact ☐____ pain < 3-4/10 or manageable ☐____ call MD if > 500ml/8 hours
2. Prevention & Screening for Delirium, Dementia & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids, mobility enhancement, non-pharmacological sleep enhancement. Assessment for delirium – CAM If distressed, consider pharmacological management only if necessary	☐____ ☐____ ☐____
3. Tests		
4. Treatments	*Titrate O_2 to keep SaO_2 > 94%*	☐____ call MD if pt requires > 4L/min O_2
5. Medication	Post op pain management (as per protocol) Antibiotic (as per protocol) Anticoagulant, if warfarin is used, a longitudinal anticoagulant record must be maintained (per protocol) Antiemetics as required (as per protocol)	☐____ *pain 3-4/10 or manageable* ☐____ ☐____ ☐____ nausea under control if not call MD
6. Fluid Nutrition Elimination	DAT – high fibre as tolerated IV fluids as per protocol reduce to TKVO/saline lock when drinking well Foley catheter as per protocol Monitor urine output	☐____ ☐____ hemodynamic stable ☐____ ☐____ monitor urine output call MD if < 240 ml/8 hours
7. Activity / Mobility	Bed rest and positioning Observe THR precautions for hemiarthroplasty Deep breathing10 deep breaths /hr, cough if secretions	☐____ ☐____ ☐____
8. Client / Family Perspective	Provide emotional support	☐____
9. Discharge Planning		☐____

Date: _____ Arrived on unit _____ hr	**Post-op Day 1**

	Interventions	Outcomes
1. Assessment	Assessment (as per protocol) VS q shift if stable CSM q shift if stable SaO_2 q shift if stable until pt off O_2. D/C O_2 if >94%. Dressings BID Pain q4h and prn (as per protocol)	☐____ stable call MD if BP < 90 systolic or temp > 38.5 ☐____ stable ☐____ stable ☐____ dressings intact ☐____ pain < 3-4/10 or manageable
2. Prevention & Screening for Delirium, Dementia & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids, mobility enhancement, non-pharmacological sleep enhancement. Assessment for delirium – CAM If distressed, consider pharmacological management only if necessary	☐____ ☐____delirium assessed, inform MD/ Geriatric Services ☐____
3. Tests	CBC, lytes, BUN, creatinine , BS (if diabetic)	☐____
4. Treatments	Titrate O_2 to keep $SaO_2 \geq$ 92- 94%, D/C is $SaO_2 \geq$ 94% on room air Change wound dressing as per protocol Remove wound drain if output < 100 ml/ 8hours (if applicable) Inform MD of INR results for Warfarin order (if applicable) Blood transfusion if required (as per protocol)	☐____ call MD if pt. Requires > 4L/min O_2 ☐____incision clean/intact ☐____ ☐____ call MD if Hb <80 or pt. Symptomatic or Hb<100 with cardiac dis. ☐____
5. Medication	Post op pain management (as per protocol) Anticoagulant, if warfarin is used, a longitudinal anticoagulant record must be maintained (per protocol) Antiemetics (as per protocol) Bowel routine (as per protocol)	☐____ *pain 3-4/10 or manageable* ☐____ ☐____ nausea under control if not call MD ☐____
6. Osteoporosis Strategy	Continue Hip Fracture Osteoporosis (OP) Standing Orders Identify previous diagnosis of OP Assess need for osteoporosis management Tests – lytes, creatinine Order Calcium 500mg bid/Vitamin D3 1000 Units	☐____ ☐____ ☐____ ☐____ ☐____
7. Fluid Nutrition Elimination	Continue DAT -high fiber as tolerated Monitor dietary intake & output q shift (bowel sounds) IV fluids as per protocol, D/C when drinking well Foley catheter as per protocol, D/C as appropriate Monitor urine output / urinary retention	☐____ ☐____ ☐____ hemodynamic stable ☐____ ☐____ monitor urine output call MD if < 240 ml/8 hours

	Interventions	Outcomes
7. Activity / Mobility	Initiate PT treatments bid OT assessment as required Up in chair with assistance Encourage deep breathing & coughing Ed. Hip Precautions Active / assisted bed exercises THR begin AAROM exercises Teach safe transfer techniques Gait training begin assisted walking if stable Weight Bearing as tolerated: (unless otherwise stated by MD) ☐ WBAT ☐TWB ☐NWB	☐____ ☐____ ☐____ Up in chair _____min. ☐____ ☐____verbalize understanding ☐____ ☐____ ☐____ codes I – independent A- assistance U – unable Pt transferring ↔lying to sitting _I A U_ assist Sitting ↔ standing _I A U assist ☐____ Up to stand _____ WB _____ Aid _____ assist Ambulated _____meters _____aid _____assist Up in chair _____ mins _____Stairs
8. Client / Family Perspective	Identify and address patient / family concerns	☐____
9. Discharge Planning	Consult Social Work Establish discharge plan and goals	☐____ ☐____

Date: _____ Arrived on unit _____ hr	**Post-op Day 2-3**

	Interventions	Outcomes
1. Assessment	Assessment as per protocol: VS q shift if stable CSM q shift if stable SaO_2 q shift if stable until pt off O_2. D/C O_2 if >94%. Incision check q shift Pain q4h and prn	☐____ ☐____ stable call MD if BP < 90 systolic or temp > 38.5 ☐____ stable ☐____ stable ☐____ incision clean / intact ☐____ pain < 3-4/10 or manageable
2. Prevention &Screening for Delirium, Dementia & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids, mobility enhancement, non-pharmacological sleep enhancement. Assessment for delirium – CAM If distressed, consider pharmacological management only if necessary Screen for Dementia – MMSE baseline	☐____ ☐____delirium assessed, inform MD/ Geriatric Services ☐____ ☐____MMSE completed
3. Tests	CBC, lytes, creatinine , PT/INR if taking warfarin postop, BS (if diabetic) on post op Day 3 Daily INR only for patients on warfarin	☐____ call MD if Hb <85 or pt. symptomatic ☐____
4. Treatments	*Titrate O_2 to keep SaO_2 > 94%. D/C is SaO_2 ≥ 94% on room air* Change wound dressings (as per protocol) Inform MD of INR results for Warfarin order (if applicable) Blood transfusion (as per protocol) – if needed	☐____ call MD if pt. still requires O_2 ☐____ incision clean / intact ☐____ ☐____ call MD if Hb <80 or pt. Symptomatic or Hb<100 with cardiac dis
5. Medication	Post op pain management - oral analgesics (as per protocol) Anticoagulant, if warfarin is used, a longitudinal anticoagulant record must be maintained (per protocol) Antiemetics as required Bowel routine(as per protocol)	☐____ *pain , 3-4/10 or manageable* ☐____ ☐____ nausea under control if not call MD ☐____
6. Osteoporosis Strategy	Continue Hip Fracture Osteoporosis Standing Orders Initiate Calcium 1200mg all sources/Vitamin D3 800-1000 Units daily Tests – lytes, creatinine Begin muscle strengthening, balance and posture exercises for OP management -PT Provide Osteoporosis Pt/ Family Education – "A Guide to Osteoporosis for Patients with Fracture"	☐____ ☐____ ☐____ ☐____ ☐____
7. Fluid Nutrition Elimination	DAT – high fibre as tolerated Monitor dietary intake & output q shift (bowel sounds) IV fluids as per protocol. D/C when drinking well D/C routine Foley catheter - Intermittent catheterization q 4-6 h prn to keep volumes ≤400cc Monitor urine output / urinary retention	☐____ ☐____ Pt has had bowel movement ____ ☐____ ☐____ monitor urine output call MD if < 240 ml/8 hrs ☐____call MD if urinary retention

	Interventions	Outcomes
8. Activity / Mobility	PT treatments bid OT intervention – assessment of ADLs & review of home equipment needs if plan for discharge home Encourage deep breathing and coughing Continue Active / Assisted bed and chair exercises THR progress AAROM exercises THR review precautions Teach safe active assisted transfers from bed to chair and sit to stand Gait training assisted walking in AM and PM	☐_____ ☐_____ ☐_____ ☐_____ ☐_____ ☐_____ ☐_____ codes I – independent A- assistance U – unable Pt transferring ↔lying to sitting _I A U_ assist Sitting ↔ standing _I A U assist ☐_____ Up to stand _____ WB _____ Aid _____ assist Ambulated _____meters _____aid _____assist Up in chair _____ mins _____Stairs Pt transferring ↔lying to sitting ____ assist Sitting ↔ standing ____ assist Up to stand _____ WB _____ Aid _____ assist Ambulated _____meters _____aid _____assist Up in chair _____ mins
9. Client / Family Perspective	Identify and address patient / family concerns	☐_____
10. Discharge Planning	Confirm DC discharge plan for all Refer to Inpt Rehab – Day 2	☐_____ ☐_____

Date: _____ Arrived on unit _____ hr	**Post-op Day 4 Target Discharge to Inpatient Rehab**

	Interventions	Outcomes
1. Assessment	Assessment (as per protocol): VS q shift if stable CSM q shift if stable SaO_2 q shift if stable until pt off O_2. D/C O_2 if >94%. Incision check q shift Pain q4h and prn	☐____ ☐____ stable call MD if BP < 90 systolic or temp > 38.5 ☐____ stable ☐____ stable ☐____ incision clean / intact ☐____ pain <3- 4/10 or manageable
2. Prevention & Screening Delirium, Dementia & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids, mobility enancement, non-pharmacological sleep enhancement. Assessment for delirium – CAM If distressed, consider pharmacological management only if necessary Screen for Dementia – MMSE baseline	☐____ ☐____delirium assessed, inform MD/ Geriatric Services ☐____ ☐____MMSE completed
3. Tests	INR if taking warfarin	
4. Treatments	Change wound dressings (as per protocol) Inform MD of INR results for Warfarin order (if applicable)	☐____ incision clean / intact ☐____
5. Medication	Post op pain management- oral analgesics (as per protocol) Anticoagulant, if warfarin is used, a longitudinal anticoagulant record must be maintained (per protocol) Antiemitics as required: Bowel routine (as per protocol)	☐____ *pain , 3-4/10 or manageable* ☐____ ☐____ nausea under control if not call MD ☐____
6. Osteoporosis Strategy	Continue Hip Fracture Osteoporosis Standing Orders Order Bone Mineral Density Testing (if possible) Calcium 1200 mg all sources /Vitamin D3 800-1000 Units daily Begin muscle strengthening, balance and posture exercises for OP management -PT Provide Osteoporosis Pt/ Family Education – "A Guide to Osteoporosis for Patients with Fracture" Consider orders for pharmaceutical treatment for OP	☐____ ☐____ ☐____ ☐____ ☐____ ☐____
7. Fluid Nutrition Elimination	High fiber DAT as tolerated Monitor dietary intake & output q shift (bowel sounds) IV fluids as per protocol. D/C when drinking well Monitor urine output / urinary retention	☐____ ☐____ Pt has had bowel movement_____ ☐____ monitor urine output call MD if < 240 ml/8 hrs ☐____call MD if urinary retention

	Interventions	Outcomes
7. Activity / Mobility	PT treatments bid (as per protocol) OT intervention (as per protocol) Encourage deep breathing and coughing Encourage independence in self care Continue Active / assisted bed and chair exercises THR review precautions Teach safe active assisted transfers from bed to chair and sit to stand Gait training assisted walking in AM and PM Initiate stair climbing exercise with supervision if going home	☐____ ☐____ ☐____ ☐____ ☐____ ☐____ ☐____ codes I – independent A- assistance U – unable Pt transferring ↔lying to sitting _I A U_ assist Sitting ↔ standing _I A U assist ☐____ Up to stand _____ WB _____ Aid _____ assist Ambulated _____meters _____aid _____assist Up in chair _____ mins _____Stairs Pt transferring ↔lying to sitting ____ assist Sitting ↔ standing ____ assist Up to stand _____ WB _____ Aid _____ assist Ambulated _____meters _____aid _____assist Up in chair _____ mins _____Stairs
8. Client / Family Perspective	Identify and address patient / family concerns	☐____
9. Discharge Planning	Confirm DC discharge plan for all Criteria for DC to Inpatient Rehab to be met in AM (medically stable) Confirm with CCAC re discharge home Ed: If patient going home on warfarin, FD or warfarin supervisor to be personally contacted with a request to supervise warfarin, and informed of all in-hospital warfarin doses, all INR values and the next INR date.	☐____ ☐____Pt temp < 38,☐____ off O2, ☐____VSS, ☐____ incision intact, ☐____HB > 80 / asymp., ☐____voiding well, ☐____tolerating diet, ☐____**Pt understands rehab goals / outcomes** ☐____Letter to MD done ☐____Transfer sheet completed ☐____ FU appointment booked ☐____

Date: _____ Arrived on unit _____ hr	**Post-op Day 5 Target Discharge to Inpt Rehab/Home**

	Interventions	Outcomes
1. Assessment	Assessment (as per protocol): VS q shift if stable CSM q shift if stable Incision check Pain q4h	☐____ ☐____ stable call MD if BP < 90 systolic or temp > 38.5 ☐____ stable ☐____ call MD if pt still requires O2 ☐____ incision clean / intact ☐____ pain < 3-4/10 or manageable
2. Prevention & Screening for Delirium, Dementia, & Depression	Consider delirium prevention strategies – orientation protocols, fluid enhancement, availability of vision/hearing aids, mobility enhancement, non-pharmacological sleep enhancement. Assessment for delirium – CAM If distressed, consider pharmacological management only if necessary	☐____ ☐____delirium assessed, inform MD/ Geriatric Services ☐____
3. Tests	CBC, lytes, BUN/creatinine, BS (if diabetic) INR if patient on warfarin and not discharged or transferred	☐____ ☐____
4. Treatments	Change wound dressings (as per protocol) Inform MD of INR results for Warfarin order (if applicable)	☐____ incision clean / intact ☐____
5. Medication	Post op pain management- oral analgesics (as per protocol) Anticoagulant, if warfarin is used, a longitudinal anticoagulant record must be maintained (per protocol) Antiemetics as required Bowel routine (as per protocol)	☐____ *pain , 3-4/10 or manageable* ☐____ ☐____ nausea under control if not call MD ☐____
6. Osteoporosis Strategy	Continue Hip Fracture Osteoporosis Standing Orders Calcium 1200mg all sources/Vitamin D3 800-1000 Units daily Muscle strengthening, balance and posture exercises for OP management -PT Provide Osteoporosis Pt/ Family Education – "A Guide to Osteoporosis for Patients with Fracture" Consider orders for pharmaceutical treatment for OP OP Letter to FD to be sent	☐____ ☐____ ☐____ ☐____ ☐____ ☐____
7. Fluid Nutrition Elimination	High fiber DAT as tolerated Monitor dietary intake & output q shift (bowel sounds) Monitor urine output / urinary retention q shift	☐____ tolerating oral intake ☐____ Pt has had bowel movement____ ☐____ call MD if urinary retention

	Interventions	Outcomes
8. Activity / Mobility	PT treatments bid OT interventions (as per protocol) ADL and review of home equipment needs Encourage deep breathing and coughing Encourage independence in self care Continue Active / assisted bed and chair exercises THR progress AAROM exercises THR Hip Precautions (if necessary) Gait training assisted walking in AM and PM Teach safe active assisted transfers from bed to chair and sit to stand Continue stair climbing exercise with supervision if going home	☐____ ☐____ ☐____ ☐____ ☐____ ☐____ ☐____ ☐____ Ambulate independently with walking aids ☐____Able to transfer in / out of bed and chair independently ☐____ Able to use bathroom independently ☐____ Able to manage stairs if required ☐____ Able to do ADL's as required
9. Client / Family Perspective	Express confidence in activity level and safe precautions	☐____
10. Discharge Planning	Discharge Inpt Rehab or Home today	☐____Pt temp < 38,☐____ off O2, ☐____VSS, ☐____ incision intact, no drainage from incision site, staples intact, no s& s of infection, ☐____HB > 80 / asymp., ☐____voiding well, ☐____tolerating diet, ☐____Pt understands rehab goals / outcomes ☐____ Discharge notification completed ☐____Transfer order written ☐____ Transfer sheet completed ☐____ FU appointment booked ☐____ Script if DC home ☐____Staple remover provided ☐____If discharged home, Patient must book a follow-up appointment with family MD for staple removal ☐____Post discharge thromboprophylaxis protocol arranged. If patient going home on warfarin, FD or warfarin supervisor to be personally contacted with a request to supervise warfarin, and informed of all in-hospital warfarin doses, all INR values and the next INR date. ☐____Osteoporosis (OP) Strategy. If discharged home, patient to receive OP Form letter. Education materials for Pt, BMD testing date if available. Letter to FD to be sent.

	Interventions	Outcomes
10. Discharge Planning	Discharge Inpt Rehab or Home today	□____ Patient unable to be discharged today specify reason below: □ Delirium □ Medical issues:_____ □ Wound related □ Unmanaged pain □ Nausea & vomiting, Not tolerating diet □ Anaemia related concerns □ Voiding difficulties □ Mobility not satisfactory □ Inadequate home supports □ Patient cleared to go by team but reluctant to leave explain:_____ □ Awaiting transfer to hospital, rehab, etc □ Other:_____

Appendix (Available through the www.boneandjointhealthnetwork.ca)

Patient/Family Teaching Material:

1. Hip Fracture Model of Care Patient/Families Education Booklet
2. Understanding Dementia, Delirium and Depression Information for Patients/Families (Adapted from RNAO BPG Project)

Osteoporosis Materials:

3. Osteoporosis Hip Fracture Standing Order Sheet
4. Osteoporosis Letter for Family Doctors
5. Osteoporosis Patient/Family Letter
6. Osteoporosis Booklet – A Guide to Osteoporosis for Patients with Fracture
7. Osteoporosis Exercise Program

Appendix D

Quick Reference Guide

Improving Time to Surgery - Emergency Room, Preoperative and Immediate Postoperative Clinical Practice Guidelines for Hip Fracture Patient Management

The Ontario Orthopaedic Expert Panel through the Bone and Joint Health Network has developed a Provincial Hip Fracture Model of Care. This model flows patients across the health care continuum and provides best practice standardized guidelines for care. Integrated into this model is the target for 90% of hip fracture patients to receive surgery within 48 hrs of ER admission.

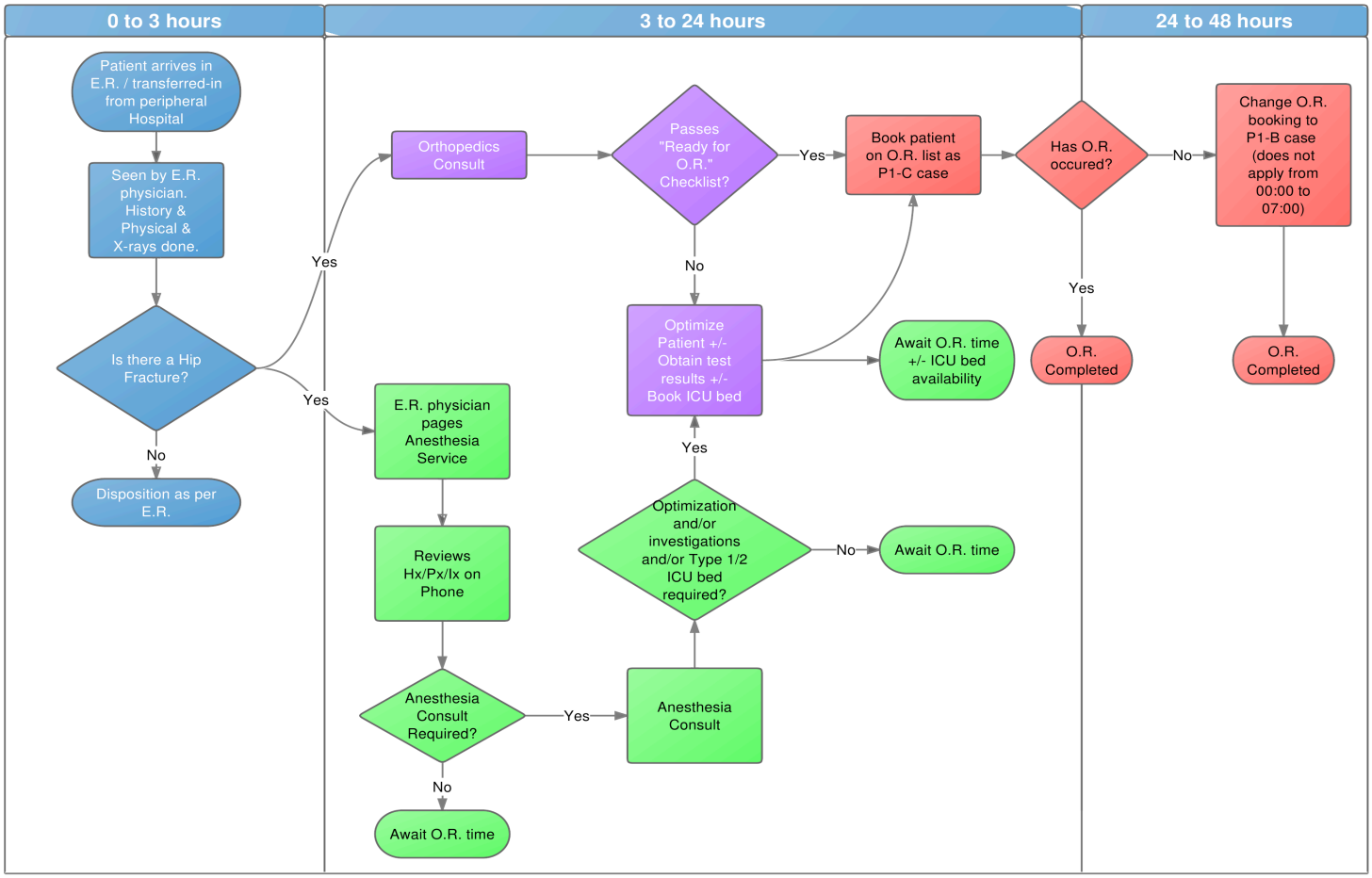
Recommendations to improve time to surgery for patients following a hip fracture have been developed and are outlined below. This Quick Reference Guide will provide healthcare professionals with a summary of the most important recommendations. For detailed information, consult the full guidelines document at www.boneandjointhealthnetwork.ca.

Recommendation

Timely Surgery - Early surgery within 48 hours of presentation to hospital should occur for most patients. Short delays may be justified to gain improvement in clinical condition. However, it is important not to pursue unrealistic medical goals with resulting delays.

Figure 1. Preoperative pathway algorithm for hip fracture patients to achieve timely surgery within 48 hours.

Hip Fracture Preoperative Pathway



RECOMMENDATIONS

A. Emergency Room Care

1. **Triage, Early Recognition, Assessment and Diagnosis -** Early recognition of patients with a potential hip fracture requires higher prioritizing within the triage category. Established protocols or medical directives are useful to expedite diagnosis and treatment. Patient assessment should include mechanism of the fracture and associated injuries as well as a thorough review of co-existing health issues. Assessment should be timely:
   - Emergency physician/health team assessment within *one hour* of presentation.
   - Orthopaedic surgeon, anaesthesiology and/or internal medicine within *two hours*

   Patient review by the anaesthesiologist should determine the depth of investigations needed for safe peri-operative care, and any necessary pre-operative interventions (i.e. anticoagulation reversal).
2. **Immediate Management Issues**
   - ***a. Pain management*** - Pain control is important and a multimodal approach should be considered using a more than one drug approach to provide better analgesia with fewer side effects. Most commonly, titration of intravenous opioids, such as morphine or hydromorphone are used for analgesia. Analgesics such as acetaminophen can be co-administered to enhance patient analgesia. A regional nerve block may be considered as an analgesia adjunct, especially for those who poorly tolerate systemic analgesics. Continuation of long-acting opioids for patients who have pre-existing chronic pain conditions should generally occur to ensure adequate analgesia and prevent withdrawal symptoms. Standardized pain assessment tools should be used to assess a patient's level of discomfort.
   - ***b. Hydration*** - Patients are frequently poorly hydrated on entry to the ER or may become dehydrated while waiting for surgery. Hydration, whether intravenous or oral should be assessed carefully and continuously monitored.
   - **c. *Prevention of pressure sores* –** Prevention of pressure sores should include transfer to an appropriate hospital bed with a pressure-relieving mattress. Those at high risk should receive care using a large-cell, alternating-pressure air mattress or similar device. Consideration needs to be given to using soft surfaces to protect heels and the sacrum. Clinical judgment and identified assessment tools should be used to determine patients at risk.
   - **d. *Nutritional status* -** All patients should have a nutritional assessment, so that protein and energy supplements can be provided as needed. Protein and energy feeds may reduce medical complications and mortality.
     Fasting guidelines are used to decrease the risk of aspiration in patients undergoing anesthesia. The Canadian Anesthesiologists' Society guidelines for fasting are:
     ≥ 2 hours – Clear fluids
     ≥ 6 hours – Light meals (ie. toast, non-human milk)
     ≥ 8 hours – Heavy meals (ie. meat, fried or fatty foods)
   - **e. *Reducing the potential for delirium*** - These patients are at high risk for delirium both pre and post-operatively. The prevention of delirium is the most effective strategy for reducing its frequency and complications. It is important that interventions start in the ER.
   - **f. *Osteoporosis management*** - Osteoporosis contributes significantly to the occurrence of a hip fracture. It is crucial that comprehensive interventions to prevent future fracture are initiated and become a routine part of hip fracture care without delay. This process should be initiated in the ER through bloodwork initiation.
   - ***g. Oxygen therapy*** - Persistent hypoxia may be present in hip fracture patients from the time of emergency admission to 48 h after surgery. Patients should have oximetry assessment, and oxygen administered as necessary.
   - ***h. Urinary catheterization* -** Avoid indwelling catheters as possible. These patients are frail older people that demonstrate a high incidence of urinary tract infections. Intermittent catheterization is preferable and has been shown not to increase the incidence of urinary tract infections.
   - ***i. Prophylactic antibiotics* -** Hip fracture patients are at risk of infections of the chest, urinary tract and wound. The administration of prophylactic intravenous antibiotics should be given as a single dose at the induction of anaesthesia.

B. *Anaesthesia Management*

1. **Management of Anticoagulation –** Patients on anticoagulation require careful review by the anaesthesiologist, as neuraxial anesthesia may be contraindicated with certain types of anticoagulation. Appropriate discontinuation of anticoagulation prior to surgery offers opportunities for optimal care by allowing the choice between general anaesthesia and neuraxial anesthesia (i.e. spinal or epidural).
   a. ***Management of patients on clopidogrel (plavix) -*** The goal for patients on clopidogrel should be early operative intervention to decrease morbidity and mortality associated with surgical delay for hip fracture patients. Current literature indicates are no serious surgical complications or increased transfusion requirements for these patients.
   b. ***Management of patients on warfarin (coumadin) -*** First-line therapy for the reversal of warfarin anticoagulation is Vitamin K. For surgery greater than six hours away, administration of intravenous Vitamin K (5-10mg) should be sufficient for reversal. If more urgent reversal is required (less than six hours), compounds such as prothrombin complex concentrate (PCC) (ie. Octaplex®) or frozen plasma (FP) may be considered along with the use of intravenous Vitamin K. PCC is probably the preferred choice over FP for those at risk for volume overload.
2. **Assessment of LV function and Significant Valvulopathies –** The importance of obtaining time consuming investigations i.e. echocardiography should be weighed against the complications associated with surgical delays >48 hours. Careful physical examination can sometimes rule out significant valvulopathies, such as severe aortic stenosis. Anaesthesiologists' may consider heightened intraoperative monitoring (i.e. arterial waveform monitoring) when pre-operative cardiac investigations are not available in a timely fashion.

C. *Surgical Management*

1. **Types of Intra-operative Anaesthesia – Neuraxial vs. General Anaesthesia –** Both general and neuraxial anaesthesia are commonplace for hip fracture surgery. Neuraxial anaesthesia may decrease post-operative confusion, thromboembolism development, intraoperative blood loss and short-term mortality. There are many reasons which preclude the use of neuraxial anaesthesia including anticoagulation, patient refusal, challenging anatomy and others, therefore in these situations general anaesthesia may be required. Ultimately, the choice of anaesthesia administered rests in the hands of the attending anaesthesiologist.
2. **Postoperative Delirium -** Regional anaesthesia usually decreases the onset and severity of delirium. Other purported benefits included decreased thromboembolism development, intraoperative blood loss, and short-term mortality. Often, intravenous sedation is co-administered during the operation to enhance patient comfort. Delirium interventions should be implemented.
3. **Postoperative Pain Management -** Systemic opioids (ie. morphine) are the most common form of post-operative analgesia for hip fracture. Common side effects can be more pronounced in the elderly population. Patient Controlled Analgesia (PCA) devices allow patients to self-administer intravenous opioids according to timed dose parameters set by a physician. This allows the patient to self-titrate the medication to an optimal dose, maximizing analgesia while minimizing side-effects. However, the patient must be able to cognitively understand and use the PCA device. Multimodal analgesia can enhance pain relief, while minimizing side effects.

D. *Immediate Postoperative Management*

1. **Considerations in Types of Surgery -** Careful preoperative planning must consider the level of patient demand and co-morbidity as well as the specifics of the fracture pattern and associated injuries or pre-existing musculoskeletal problems. Surgical tactics should be chosen that achieve maximal functional results while balancing the risk of implant failure, malunion, and surgical morbidity for the particular patient.
2. **Immediate Weight Bearing -** Immediate weight bearing for previously ambulatory hip fracture patients is of paramount importance in improving patient mortality and morbidity, reducing medical complications, minimizing hospital length of stay and most importantly improving functional outcome and the likelihood of future independent living. Recent advances in modern technology and implants allow for stable fixation, or replacement arthroplasty, in all cases of hip fracture. Also, patients limit their weight bearing dependant on the stability of the construct and failure rates have not increased.

E. Process management

There are a number of system factors that can lead to difficulties in patients accessing the Operating Rooms. The recommendations below provide an overview of some of the strategies that are being used within the health care organizations across Ontario to facilitate access.

1. **Operating Room Booking Priority Policy -** Hip fracture patients access to the operating room usually begins at a priority type C, and as such they should receive surgery within 48 hours. In organizations where there are a high volumes of other patients already designated as priority type B, hip fracture patients regularly do not receive surgery within this 48 hour timeframe. In these cases, changing the Operating Room Booking Policy to upgrade hip fracture patients from priority type C to priority type B after 24 hours on the operating room wait list has been effective in increasing access to surgery within 48 hours.
2. **Trauma Time -** Sufficient operating room time is required to successfully manage trauma patients, such as those with a hip fracture. Designated orthopaedic trauma operating room time is a method to increase access to timely surgery. This designated time needs to available at regular intervals each week, either daily or 3 times weekly, to manage hip fracture patients within the 48 hour timeframe.
3. **Regional Trauma Planning -** The development of a regional trauma plan is recommended and may include a written agreement between health care organizations that includes clear expectations for timely acceptance for transfer of the patient for surgery, shared pre-operative approaches, and timely repatriation of the patient back to the referral hospital for continued care.
4. **Fast Tracking to Inpatient Unit within 4 Hours –** Evidence suggests that fast tracking from the ER to the Inpatient unit is a good standard of clinical care for older people with a hip fracture, and contributes to improved pressure sore care.