Perioperative management of elderly patients suffering a hip fracture

Preparing elderly patients for emergency hip fracture surgery is a significant challenge for hospital staff. This article discusses the principles of preoperative care in these patients, and the rationale for such strategies, based on evidence and current guidelines. Such guidance increasingly reflects a national standard of care.

Fractures of the femoral neck in elderly patients are becoming increasingly common and are the most frequent cause of admission to most UK trauma services. By 2030, there will be an estimated 100 000 such fractures each year (White and Griffiths, 2011). Early surgery in this population yields better outcomes in terms of mortality, cost and patient experience (Khan et al, 2009).

The standard of care for patients with a hip fracture has historically been variable, and there have been several initiatives designed to measure differences in care between centres in order to drive improvement, including the National Hip Fracture Database and the Scottish Hip Fracture Audit. These have helped develop a national standard in hip fracture care with the implementation of timely intervention in order to achieve optimal outcomes and reduce variance in practice and outcomes. The 2011 National Hip Fracture Database Report estimated the cost of treating patients with hip fractures and providing resultant care at around £2 billion each year in the UK (National Hip Fracture Database, 2011). Mortality is high with estimates of up to 30% at 1 year after injury. The population suffering a hip fracture is three times more likely to die than age- and sex-matched individuals who did not suffer a hip fracture (LeBlanc et al, 2011). A comprehensive multidisciplinary approach aims to reduce the mortality associated with hip fracture and improve the quality of care and patient experience.

Evidence-based standards have been incorporated into the Best Practice Tariff for hip fracture (Department of Health, 2012). Patients who receive all the standards of care as set out in the British Orthopaedic Association (2007) blue book (*Table 1*) qualify for a higher tariff, generating improved income for the hospital trust. Hence, there is a financial incentive for trusts to ensure optimal care is delivered. These standards may also be included in local Commissioning for Quality and Innovation (CQIN) frameworks. However, many other areas may be addressed to optimize the preparation of such patients for surgery.

This article sets out the evidence for the principles of care required in this patient group, places this in the context of available existing hip fracture guidance and discusses the rationale for strategies in preparing this complex group of patients for early surgery.

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Early surgery

Seamless management of a patient with a fractured neck of femur depends upon input from numerous health professionals, who have to work in a coordinated manner to ensure surgery proceeds in a timely manner as soon as modifiable risk factors have been corrected.

Current National Institute for Health and Clinical Excellence (NICE, 2011) guidelines recommend that all such patients undergo surgery within 48 hours of diagnosis of a fractured neck of femur. This is in response to a growing body of evidence that delaying surgery for these patients leads to greater levels of postoperative morbidity and mortality (Shiga et al, 2008; Khan et al, 2009).

Patients presenting to the accident and emergency department with a suspected fracture of the femoral neck should be rapidly assessed and assigned to a fast track admission pathway. The rate of postoperative complications, including confusion, nosocomial infection, length of hospital stay and 12-month mortality, is lower in hip

Table 1. Standards of care required to achieve the Best Practice Tariff for hip fracture uplift

All patients aged 60 and over
Time from arrival to theatre <36 hours
Patient admitted under joint care of an orthopaedic and orthogeriatric consultant
Patient admitted using a multidisciplinary assessment tool agreed by orthopaedics
Patient assessed by a geriatrician within 72 hours of admission
Postoperative care is geriatrician-directed and multidisciplinary
Assessments of falls risk and bone health conducted
Preoperative and postoperative Abbreviated Mental Test Scores recorded

From Department of Health (2012)

fracture patients managed by a comprehensive multidisciplinary fast-track treatment and care programme (Pedersen et al, 2008; Larsson and Holgers, 2011). Initial review of such patients may be further streamlined with the use of a dedicated hip fracture proforma highlighting the care pathway and a pre-printed drug chart prepared with a standardized departmental regimen for analgesia, antiemesis and thromboprophylaxis.

Initial assessment

Upon arrival in the accident and emergency department patients should be assessed using a standardized primary survey where interventions such as analgesia and fluid resuscitation may begin. Heart rate, respiratory rate, blood pressure and body temperature should all be recorded. History taking is often challenging in this patient group. Many patients live alone, and family may not be in contact. As much relevant history as possible must be gained from care home staff, relatives and paramedics before they leave, especially if the patient is unable to give a coherent history. It is essential to establish the circumstances of any fall and to try to distinguish it from a collapse.

Another important factor to try to determine is the length of time a patient remained on the floor after a fall. Extended periods on the floor will cause pressure ulcers, hypothermia and rhabdomyolysis. These must be excluded as soon as possible via a careful history, thorough examination and ordering relevant investigations. Where there is limited evidence of significant trauma, suspicion must be high for the presence of a pathological fracture. Hence particular attention should be paid to any evidence of weight loss, previous malignancy and smoking history. Examination of the affected limb should be very limited as any movement is likely to be painful. If, however, there is minimal discomfort or the patient can move the limb freely, this should be recorded as the injury may have occurred several weeks or years ago. The neurological state of the limb along with the presence or absence of the posterior tibial and dorsalis pedis pulses should be documented. One or both of these may be absent in the elderly. A more important assessment is of foot perfusion, which should be checked using capillary refill in the toes.

Chest auscultation may reveal evidence of cardiac murmurs. Spinal anaesthesia may be contraindicated in such patients, and so this should be discussed with the anaesthetist. An echocardiogram may be obtained where necessary, although this rarely alters anaesthetic management (Griffiths et al, 2011).

Chest auscultation may commonly reveal evidence of pneumonia or left ventricular failure. Pneumonia should be treated with appropriate antibiotics while further evidence of cardiac pathology or arrhythmia should be sought with appropriate timely interventions only where they may have a role in improving outcome. Regaining control of decompensated cardiac failure or arrhythmia is essential before proceeding to surgery, and so appropriate orthogeriatric help should be sought.

Information from the history and examination should be combined to generate a picture of the fluid status of the patient. Fluid imbalance is common in these patients, and this must be carefully adjusted because high rates of cardiac and renal failure carry the potential for either acute kidney injury or fluid overload and pulmonary oedema. Useful signs may include dryness of mucous membranes, central capillary refill and jugular venous pressure. It is difficult to assess jugular venous pressure in patients with a hip fracture as this requires sitting the patient up to 45°, which is usually painful. This information may be used to start an appropriate fluid regimen.

This core examination should be followed by a careful secondary survey where the patient is examined from head to toe for other injuries. Other injuries accompanying a hip fracture may easily be missed if a thorough systematic approach is not followed.

Investigations

Baseline blood tests should include a full blood count, renal function and electrolytes, bone profile, liver function, blood glucose and a group and save. Coagulation studies should be performed only if there is a specific clinical indication (Griffiths et al, 2011). If there is a confirmed or suspicious history of the patient having lain on the floor for a prolonged time, the creatinine kinase level should also be checked in order to test for rhabdomyolysis. Urine colour should also be assessed to look for the brown colour associated with myoglobinuria.

Arterial blood gases provide useful information on blood chemistry but should not be taken as routine (Griffiths et al, 2011). This investigation may also reveal a raised lactate level or associated hyperkalaemia. A blood creatinine kinase level over five times the normal range is suggestive of rhabdomyolysis. This is a common cause of acute renal failure in patients suffering a hip fracture and carries a poor prognosis. Such patients should undergo serial measurements of blood creatine kinase along with urinary myoglobin levels as these start to rise 12 hours after muscle injury before reaching a peak at around 36 hours. Early liaison with intensive care for guidance on fluid replacement and thresholds for renal replacement therapy is essential at an early stage.

An electrocardiogram should be performed on admission to help detect concomitant cardiac problems, such as arrhythmia, evidence of ischaemia or conduction abnormalities. It is important to consider whether these are likely to have been coexistent or new and contributing to the fall that caused a hip fracture. The British Orthopaedic Association (2007) guidelines recommend routine chest radiographs in elderly patients, but this is controversial. This investigation is undoubtedly recommended in patients who are newly diagnosed with heart failure or where there is clinical suspicion of significant acute chest pathology, such as pneumonia or rib fractures.

The use of a chest radiograph is governed by NICE guidelines but may be of value to the anaesthetist for the

information it gives about the mediastinal shadow and heart size as well as revealing any thoracic fractures associated with a fall. A supine anteroposterior film is usually satisfactory.

Early consultation with the anaesthetic team is needed in order to prevent delays and identify correctable physiological disturbances.

Analgesia

The most effective form of analgesia for hip fracture is surgical treatment of the fracture, hence the importance of early surgery. Nonetheless, analgesic requirements should be assessed and therapy should commence as soon as possible after injury. Various modes of analgesia have been described and can be used effectively in the accident and emergency setting. The most commonly used are pharmacological methods. Guidelines from NICE advise the use of paracetamol and oral morphine solution as first-line analgesia. Opioid analgesics must be prescribed with caution in the elderly because of frequent undesirable effects such as delirium, nausea and, more commonly, constipation. Furthermore several commonly used antiemetics used in combination with opiates also cause central sedation, which is undesirable. Non-steroidal anti-inflammatory drugs should also be used with extreme caution in this patient population and diclofenac is now contraindicated in patients with pre-existing ischaemic heart disease, cerebrovascular accident, cardiac failure or peripheral arterial disease.

Local anaesthetic blocks may be a useful adjunct to preoperative analgesia. The fascia iliaca block, which does not require sophisticated equipment, is also useful and may be effectively performed by accident and emergency doctors (Foss et al, 2007). This block was found to be significantly more effective than morphine, both at rest and during motion of the affected leg. This also reduced the need for parenteral analgesia before surgery.

Fluid management

All acute hospitals should have a fluid resuscitation protocol for patients suffering hip fractures. NICE advises that an intravenous cannula be placed immediately and the patient started on intravenous fluids irrespective of whether or not immediate surgery is planned. This should be combined with an early review of electrolyte levels. Optimal fluid management affects both survival and future rehabilitation (Khan et al, 2009). The rate of intravenous fluid administration should be dictated by the patient's haemodynamic status although extra caution should be exercised where there is evidence of decompensated cardiac failure or renal failure.

A typical fluid regimen in a patient who is not shocked or in cardiac failure would be 5–10 ml/kg of crystalloid over 2 hours (Wilson, 2010). The use of perioperative colloids has not been found to improve outcomes in patients with a hip fracture (Parker et al, 2004). Furthermore, hydroxyethyl starches have been withdrawn from clinical usage from June 2013. Fluid replacement should be given as a balanced salt solution, such as Ringer's lactate or Hartmann's solution, instead of 0.9% saline as a result of the risk of hyperchloraemic metabolic acidosis (Powell-Tuck et al, 2011).

Oxygen therapy

The use of preoperative intravenous fluids together with preoperative supplemental oxygen reduces the incidence of delirium (Björkelund et al, 2010). All patients should have regular saturation monitoring in order to ensure adequate oxygenation. Many will require supplemental oxygen and this should be titrated to an appropriate level of saturation. The British Thoracic Society recommends that this should be 92–98% in most patients (British Thoracic Society, 2008). However, patients with a history of chronic obstructive pulmonary disease or type 2 respiratory failure should have a target saturation of 88–92%. The chosen oxygen regimen should always be prescribed on the patient's drug chart.

Careful attention to appropriate analgesia, hydration and oxygenation on admission may have a very significant impact on outcome after this injury and meticulous care must be taken in ensuring these are appropriately addressed.

Blood transfusion

There has been considerable debate about which patients benefit most from perioperative blood transfusion. Admission haemoglobin concentration commonly overestimates the true level. The haematocrit will also be unchanged following an acute bleed. Haemoglobin level will fall once the patient has been resuscitated with fluid. This is especially important in extracapsular fractures when bleeding is more extensive. However, several studies have cast doubt over the potential benefits of a liberal autologous transfusion policy in the elderly patient with a hip fracture. Liberal transfusion (at <10 g/dl) confers no additional benefit compared to restrictive transfusion protocols (at <8 g/dl) in terms of speed of rehabilitation (Foss et al, 2009). Liberal transfusion was also shown to have no significant effect on rates of death, in-hospital morbidity and mobility (Carson et al, 2011). Hence, a transfusion threshold close to the lower level of 8 g/dl may be most appropriate, although this should be judged on a case-by-case basis.

Thromboprophylaxis

All patients should undergo assessment for their risk of thromboembolic events. Both mechanical and pharmacological agents have been shown to be effective in decreasing thromboembolic complications in this group of patients (Hitos and Fletcher, 2005). There is, however, some concern regarding the potential of thromboembolic deterrent stockings to cause skin damage in elderly patients (Dennis et al, 2009). Consequently, many units rely solely on chemical thromboprophylaxis, commonly low molecular weight heparin. Care should be taken with this medication in patients with renal dysfunction.

Optimization of medical comorbidities

Patients who have suffered a hip fracture often present with complex medical comorbidities. The admitting doctor must suspect previously unrecognized comorbidities as well as derangement of previously known conditions such as diabetes. These must be recognized at the time of admission and immediate management commenced. Specific guidelines for hip fracture have been drawn up by the Working Party of Anaesthetists (Griffiths et al, 2011). These aim to prevent unnecessary delays to surgery and are outlined in *Table 2*. The input of an orthogeriatrician can be crucial when dealing with complex issues, such as the optimization of medical comorbidities, consent, nutrition, resuscitation status and palliative care. In such cases, the orthogeriatrician is usually the best person to consult with patients and their relatives.

Consideration should be given to discontinuing antiplatelet drugs preoperatively. When making this decision the clinician should weigh the risks of stopping these therapies, mainly between the risk of rebound thromboembolic events and delaying surgery to wait for the anticoagulant effect to wear off and the risks of perioperative bleeding. In patients taking clopidogrel or dipyridamole before the injury, general anaesthesia is preferable to spinal or epidural anaesthesia to reduce the incidence of spinal haematoma. However, the risks of this may have to be compared with the potential benefits of spinal anaesthesia in certain patients.

The effect of antiplatelet drugs on surgery-related blood loss and perioperative complications is unclear, and the management of trauma patients treated by antiplatelet agents is controversial. Patients on aspirin can safely undergo hip fracture surgery without delay and without discontinuing the drug (Chechik et al, 2011).

The manufacturers of clopidogrel recommend stopping the drug 7 days before surgery, although this is impractical for patients with a hip fracture and is likely to significantly worsen outcomes. In one study, blood losses of a clopidogrel group and a control group were similar in the hands of an experienced surgeon (Shiga et al, 2008).

Some UK centres use dedicated areas, where patients with hip fractures receive multidisciplinary input from the surgical, anaesthetic, intensive care and orthogeriatric teams along with a greater level of nursing care than standard ward care. This may improve outcomes in patients who require optimization of medical comorbidities, but may also be beneficial in allowing more frequent assessment of analgesic requirements and providing a central focus point for surgical planning. The Sernbo score has been suggested as a simple effective tool to aid patient selection for this type of facility (Dawe et al, 2013).

Consent

Decisions which relate to the management of all such patients must be clearly communicated to the patient and his/her relatives. Information regarding procedures, their risks and benefits must be communicated effectively and in sufficient detail by appropriately trained staff. Furthermore, this may help manage the expectations of patients and relatives with regard to the speed and extent of recovery after surgery. An information leaflet may be beneficial to remind patients and their relatives of details of the injury and planned procedure. The most appropriate time to discuss resuscitation status with patients and their relatives may be before the surgery. This allows clear communication and timely end-of-life decision making.

Informed consent for hip fracture surgery has historically been taken by busy junior doctors who are sometimes unfamiliar with the procedure, its technical details and complications. As a result, consent forms are sometimes illegible and often inconsistent in the complications listed, with common complications missed (Rahman et al, 2011). Such evidence has prompted the suggestion of using standardized preprinted consent forms to improve the quality of informed consent in this patient group. This has also been endorsed by the British Orthopaedic Association. Consent should only be taken by an individual who is familiar with the procedure in question and is fully appraised of the risks, benefits, rehabilitative requirements and the consequences of inaction.

It is important to assess the patient's mental capacity before attempting to take informed consent for surgery. Where there is any doubt in the patient's capacity, it remains the doctor's decision to administer treatment that is deemed to be both necessary and in the patient's best interests, as advocated in the Mental Capacity Act 2005. This decision should be confirmed by a senior surgeon or orthogeriatrician. If a patient lacks capacity and has no other advocate then one may be appointed to act for them by the Independent Mental Capacity Advocate Service. The appointed Independent Mental Capacity Advocate may then take part in discussions on the risks and benefits of surgery on behalf of the patient.

Table 2. Working Party of Anaesthetists acceptable and unacceptable reasons for delaying surgery for hip fracture

Acceptable	Haemoglobin concentration <8 g/dl
	Plasma sodium concentration <120 mmol/litre or >150 mmol/litre and potassium concentration < 2.8 mmol/litre or > 6.0 mmol/litre
	Uncontrolled diabetes mellitus
	Uncontrolled or acute onset left ventricular failure
	Chest infection with sepsis
	Reversible coagulopathy
	Correctable cardiac arrhythmia with a ventricular rate > 120/min
Unaccceptable	Lack of facilities or theatre space
	Awaiting echocardiography
	Unavailable surgical expertise
	Minor electrolyte abnormalities

From Griffiths et al (2011)

Organizational factors

The initial assessment of patients with a hip fracture should include realistic planning for when surgery may take place. It is imperative to avoid repeated episodes of fasting before surgery, so decisions on the timing of surgery should be expedient, documented and relayed clearly to the ward staff. Anaesthetic guidelines recommend that patients should be allowed to eat up to 6 hours and drink clear fluids up to 2 hours before surgery (Brady et al, 2003).

On admission to a ward, the nurse in charge should ensure that a pressure-relieving mattress is available for the patient. These should be provided for all patients with a hip fracture to avoid the risk of pressure ulcers (McInnes et al, 2008). Patients should also undergo a nutritional assessment in order for appropriate dietary supplementation to commence as early as possible.

Discussion of the patient and his or her fracture at the daily trauma meeting ensures that a sound consultant-led decision is made regarding the type of surgery. This also facilitates the compilation of an accurate and prioritized trauma theatre list which may then be discussed at an organized meeting in theatre, well in advance of starting the list. This ensures that the entire theatre team, including the anaesthetist, is aware of the patient with the hip fracture such that any concerns may be addressed in a timely manner.

Conclusions

The preparation of elderly patients with hip fractures for surgery is a time-sensitive multidisciplinary approach. It is best achieved using clear processes and with effective communication between hospital teams. Such an approach may well help to improve outcomes after hip fracture in the elderly. **BJHM**

Conflict of interest: none.

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KEY POINTS

- Timely identification and treatment of reversible pathology is essential to allow early surgery in this complex patient group.
- Patients should be carefully assessed to identify other injuries associated with a fall, or which could have contributed to a collapse.
- Multidisciplinary team working is essential for optimal hip fracture management.