

## **A-Z of optimisation for pre-operative fractured femur patients**

### **Aim**

- Keep time to theatre to a minimum. Less than 36 hours from admission
- The rapid identification and optimisation of problems in the NOF population

If you work within these guidelines, patients will probably be accepted for theatre  
Remember, delay to theatre affects morbidity and mortality

### **Analgesia**

Regular paracetamol PO 1g QDS should be prescribed. In addition add 30-60mg QDS PRN codeine. Avoid the use of NSAIDs in this elderly group. PRN Morphine 2.5-10mg s/c or PO should be available for breakthrough pain.

### **Antibiotics**

Via the intranet please access

<http://pharm/docs/asg/guidelines/surgery/traumaortho.pdf> for the policy

### **Atrial fibrillation**

Persistent evidence of a stable ventricular rate below 100/min is essential. It is not unusual for a patient to develop rapid atrial fibrillation after admission despite a controlled rate on the admitting ECG. In such cases a new ECG must be performed to establish the current rate/rhythm. Ward recording of the apical rate not the peripheral rate is essential.

If control is poor:

Exclude or treat precipitating factors if possible. Check potassium and magnesium. Consider hypovolaemia, sepsis, pain, hypoxaemia and coronary events.

Once poor rate control has been identified urgent review and treatment by ortho-geriatrics is essential

A repeat ECG should be available post treatment demonstrating rate control.

## Blood Tests

All patients should have a minimum of FBC, U&E, Group and Save performed on admission. Other tests (eg coagulation, TFTs, LFTs) should be dictated by clinical circumstances.

### 1. Acceptable pre-operative haemoglobin values

From admission to induction of anaesthesia, haemoglobin values drop on average by 10% for extracapsular fracture and 5% for intracapsular fracture. If the admission haemoglobin is <11 gm/dl then a repeat value should be performed the next morning.

Therefore be alert to borderline admission haemoglobin values dropping below the thresholds below:

- Hb must be >8.0 gm/dl for surgery in those with no history of ischaemic heart disease
- Hb >8 but <10 in those with no history of IHD, 2 units red cells should be available for theatre
- Hb must be  $\geq$ 10 gm/dl for surgery in those with ischaemic heart disease

Remember if a patient is transfused in the pre-operative period the admission group and save will no longer be valid for further cross-matching. Therefore a new sample must be collected for surgery.

### 2. Urea and electrolytes

Ideally these values should be corrected to the normal range:

- Na<sup>+</sup> 131 to 142mmol/l
- K<sup>+</sup> 3.5 to 5.5mmol/l
- Urea 3.0 to 6.5mmol/l
- Creatinine 60 to 125mmol/l

For abnormal values, acceptance for surgery will vary according to individual patient circumstances and the rate at which values are altering.

For Na<sup>+</sup> values between 125-130mmol/l discuss with the anaesthetist and ortho-geriatricians and aim to correct.

Below 125 mmol/l postpone unless agreed with an anaesthetist.

For Na<sup>+</sup> over 150 mmol/l discuss with an anaesthetist, over 155mmol/l, postpone and seek ortho-geriatric advice.

K<sup>+</sup> – Hypokalaemia is relatively easy to correct. It must be **identified and treated early**. If the value is below 3.0 discuss with an anaesthetist. Below 2.8 postpone. Over 5.5 discuss with anaesthesia and over 6.0 postpone and treat.

Creatinine - 40% of elderly NOF have raised creatinine and GFR<60 on admission. This can be a significant rise in the presence of small muscle mass. It is of the upmost importance here to assess and manage the acuteness of the rise and the patient's hydration status.

Interventions to abnormal U&E values require monitoring with **repeat** reassessments of U&E values.

## Bone Cement Implantation Syndrome

Bone cement implantation syndrome (BCIS) is a complication of orthopaedic surgery involving pressurized bone cement. It most commonly occurs in cemented hemiarthroplasty, but can occur with any procedure involving bone cement. It is characterised by sudden loss of arterial pressure, hypoxia, pulmonary hypertension, arrhythmias, loss of consciousness, and eventually cardiac arrest.

### 1. Risk Factors

#### Patient factors

- ASA III or IV (implying poor physiological reserve)
- COPD\*
- Diuretics
- Warfarin
- Pathological fracture
- Osteoporosis
- Bony Metastases
- Intertrochanteric fractures

\*Cemented hemiarthroplasty in patients with fractured NOF has been shown to produce profound pulmonary vasoconstriction, and impairment of RV function. COPD is often complicated by pulmonary hypertension due to vascular remodelling. It is possible that other patients with pulmonary hypertension may also be at risk eg: chronic CHF, although this was not statistically significant in this study possibly due to small patient numbers.

#### Surgical Risk Factors

- Previously uninstrumented femoral canal
- Use of pressurised bone cement
- Not using vents
- Not irrigating canal and drying

### 2. Recommendations

1. Identification of patients with risk factors as above.
2. Early team discussion and patient/relatives if high risk, and **consideration of other surgical options.**
3. Use of Coventry Cement Curfew at time of cementing
4. Use of invasive monitoring (arterial line +/- CVC if very high risk) if presence of any of above risk factors.
5. Pre-operative optimisation of fluid status
6. Scrupulous drying of femoral canal.
7. Maintenance of intra-operative blood pressure within 10-15% of normal with use of fluids and vasopressors.
8. Consideration of low dose adrenaline infusion around time of cementing.

Further information is available here:

[https://www.aagbi.org/sites/default/files/AAGBI Bone cement 20150114.pdf](https://www.aagbi.org/sites/default/files/AAGBI%20Bone%20cement%2020150114.pdf)

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## Chest Infection

Unless there is evidence of significant physiological compromise, a chest infection should not be an indication to postpone surgery. Such a decision will ultimately need to be made by the attending anaesthetist. Prompt ortho-geriatric led treatment is essential. In the absence of any other contraindications, spinal anaesthesia will probably be considered. An anaesthetic opinion will be required to determine the peri-operative options.

## Clopidogrel

On admission all patients on clopidogrel should have the reason for this therapy clearly established.

Stop the clopidogrel prescription immediately **unless** it is for coronary stent(s) in situ, in which case seek urgent risk/benefit discussion with the on call cardiology team re: can it be stopped for surgery?

If the patient is also on warfarin then this should be stopped and the INR normalised as per existing T&O protocol.

If the patient is also on aspirin or dipyridamole stop these on admission.

List the patient for operative repair as soon as deemed medically fit. **Do not delay** awaiting for clopidogrel effect to wear off. However aim to operate after 24 hours from the last dose (3 half lives) of clopidogrel.

If clopidogrel cannot be stopped due to coronary stent in situ (upon cardiology advice), again **do not delay** listing for surgery unless medically unfit but again aim to operate 24 hours from the last dose.

### **Indications for per-operative platelet transfusion:**

- If patients receiving clopidogrel, develop excessive or life-threatening bleeding give a platelet transfusion.
- Initially transfuse one adult therapeutic dose (one pack) over 30 minutes and assess response.
- If bleeding remains excessive give a second pack over 30 minutes.

If bleeding persists despite 2 units of platelets, contact the on-call Consultant Haematologist.

**The following groups of patients on clopidogrel may be at an even higher risk of peri-operative bleeding. In this instance consider discussion with haematology re: the pre-emptive use of platelets on induction:**

- Need for open reduction/wiring of femur below the trochanter
- Intramedullary nailings especially where tumour pathology is suspected
- Morbidly obese patients
- Any other irreversible bleeding tendency

- Peri-prosthetic fracture – Consider delaying surgery for 7 days off clopidogrel if a major revision is anticipated

***In either case***, pre-operatively discuss with the consultant haematologist the potential requirement for platelet transfusion(s) and the ordering/availability of platelets. These are not always readily available as stock in blood bank at Heartlands and rarely available as stock at Good Hope.

If thought to be required to cover the operation, they need to be ordered from the National Blood Service Birmingham Blood Centre who will guarantee delivery within 4 hours at any time day or night. If indicated, they can be delivered within 30 minutes on emergency delivery ('Blue Light') but only by authorisation from the on call Consultant Haematologist

**Finally**, if patient co-morbidities are such that there is clear benefit of delaying for neuraxial block rather than general anaesthesia (eg severe symptomatic COPD) then consider deferring surgery until clopidogrel has been withheld for 7 days **or** proceeding with spinal block under platelet cover.

## **CXR**

In order to comply with Ionising Radiation (Medical Exposure) Regulations 2000 legislation, it is no longer appropriate to request "routine pre-operative chest x-rays."

CXR should be requested when indicated below:

- Dyspnoea or acute cardio-respiratory signs/symptoms on admission
- If unable to assess pre-fracture exercise tolerance (eg immobility or history not forthcoming from patient ie confusion)
- If the patient is unable to cooperate when attempting to perform a respiratory examination
- Any suspected chest trauma
- Significant weight loss or possible metastases

The indication for a CXR must be clearly stated on the request form.

## **Diabetes**

Access clinical guidelines on the intranet:

[Guidelines for the Management of Diabetes in Patients Undergoing Surgery](#)

## Drugs

There should be accurate documentation and prescription of the patient's usual medications and dosages. If they are not available it is essential efforts are made to obtain these from the patient, careers/family or GP.

- Anti-arrhythmic, anti-anginal, antihypertensive agents – These should not be stopped pre-operatively unless clinically indicated (eg toxicity, severe bradycardia or hypotension)
- Anticoagulant/anti-platelet agents – Follow the clopidogrel and warfarin policy. If the patient is on aspirin as the **only** anti-platelet/anticoagulant this may be continued.
- Diuretics – Balance of clinical need depending upon the underlying condition, electrolyte status and state of hydration. It may be sensible to temporarily suspend/reduce some doses.
- Steroids – see guidance below

Medication can be given at any point pre-operatively and should not be withheld due to starvation for theatre.

## DVT prophylaxis

Use the Intranet Policies and Procedures Link and click on VTE policy.

## ECG

All NOF patients should have a 12 lead ECG.

ECGs should be repeated in the presence of acute arrhythmia and subsequent treatment.

Note that particular rhythms of concern are:

- Atrial Fibrillation – see notes above
- Heart blocks – pacing maybe required or made available intra-operatively
- Suspected acute ischaemic changes – consult the ortho-geriatric team in the first instance, or on call medical team if out of hours.

## Echocardiogram

An echocardiogram request can delay time to theatre. *It should only be requested if it is likely to change peri-operative management or quantification of risk.* Anaesthetic echo requests are usually indicated to assess either of the following:

- Cardiac murmurs – to exclude fixed cardiac output lesions (usually aortic stenosis)
- To establish resting LV function

### Indications for Echo are:

1. New signs of cardiac failure with or without a new murmur
2. Acutely or severely short of breath patients in whom the cause is unclear
3. A previously undiagnosed murmur in the presence of cardio-respiratory symptoms
4. A previously undiagnosed murmur in an asymptomatic individual in whom clinical features or other investigation suggest severe structural heart disease
5. A previously undiagnosed murmur where it is not possible to assess for pre-fracture cardio-respiratory symptoms or functional capacity (eg dementia)

### Echo is not indicated for:

1. Repeat assessment of previous echocardiogram with no intervening change in clinical status
2. Assessment of an innocent murmur as diagnosed by a competent physician
3. An unchanged murmur in an asymptomatic individual with a previous normal echocardiogram

Many NOF patients have already had previous echos. Much time and resource can be saved simply by checking intranet records to establish whether this is the case. If an anaesthetist requests an echocardiogram outside of these guidelines he/she must convey this to the ortho-geriatric team as soon as possible and explain the reason for the request. A simple explanation often helps speed up requests with cardiology and eliminate confusion.

## Feeding and fasting

Pre-operative guidelines are as follows:

- |          |   |
|----------|---|
| 6 hours: | Food/chewing gum and sweets/non clear fluid or milk |
| 2 hours: | Water/clear fluids                                  |

Outside of these time periods patients should be encouraged to eat and drink. IV fluids should be in place on the ward on the day of surgery. Blanket starvation is not appropriate.



## **Fluid management**

Clinically almost every NOF pre-operatively is dehydrated to some extent. This is due to a combination of factors:

- Poor nutritional intake pre fracture
- Blood loss associated with the fracture (can be over 1000mls)
- Inadequate or lapsed fluid rotas in hospital
- Confused patients removing cannulae
- Inappropriate fluid prescriptions (i.e. dextrose)
- Diuretic therapy
- All day starvation for theatre followed by subsequent cancellation.

Initially commence 1:8 Hartmann's Solution or 0.9% Saline if potassium supplementation is required. Amend fluid type and rate according to clinical state of hydration and electrolyte results. Dextrose solutions are discouraged out of concern for the development of peri-operative hyponatraemia.

Remember the aim of fluid management is to

- Restore normal circulating blood volume
- Maintain adequate urine output and prevent renal function deterioration
- Maintain normal electrolyte values

## **Medical notes**

NOF patients usually have multiple co-morbidities. Trust medical records often contain a wealth of valuable information on pre fracture medical status, previous anaesthetics, drug therapy, echocardiograms and other cardiac investigations (eg angiograms and stress tests). They are useful to create an appropriate anaesthetic plan and to evaluate risk.

Medical records must be requested promptly via the ward clerk. If this is logistically impossible or will delay time to theatre, retrieval of key past medical history from the intranet records or GP may have to suffice. In certain circumstances this may not be adequate.

## **Myocardial Ischaemia or Troponin T elevation**

Initially an urgent ortho-geriatric review is required. Once initial treatment has been established and the patient is stable a consultant anaesthetic opinion should be sought to consider the risk/benefit of proceeding with surgery, if necessary with post-operative cardiology support.

Limited evidence suggests that this patient population could have a 4-5 fold greater mortality at 30 days when compared to all hip fracture patients. Peri-operative planning should involve robust risk counselling and the consideration of high dependency care post-operatively.

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## Novel Anticoagulants

NICE have recently approved a number of anticoagulants for use in the prevention of thromboembolic events from inherited or acquired disease eg: AF, prosthetic heart valves. They may require suspension and conversion to Low Molecular Weight Heparin, dependent upon the type of surgery and the underlying patient risk factors. Their elimination is dependent upon renal function.

**Dabigatran** – direct thrombin inhibitor

**Rivaroxaban, Apixaban, Fondaparinux** – factor Xa inhibitors.

Unlike other heparin and warfarin, there is no means of monitoring the level of anticoagulation with these drugs. There are also no antidotes to their activity. Hence, patients presenting for surgery on these drugs should be **discussed with a Haematology Consultant** prior to embarking upon surgery.

As a guide:

### **Planned Surgery**

- Major surgery in patient at high risk of thrombosis using CHA<sub>2</sub>DS<sub>2</sub>VASc score ([link here](#)) – stop anticoagulant 5 days pre-op. Commence treatment dose of LMWH 3 days pre-op, and convert this to prophylactic dose the evening before surgery.
- Minor surgery – stop anticoagulant 2 days prior to surgery, and administer prophylactic dose of LMWH night before surgery.

**NOTE:** If GFR <80 ml/min, then patient should be treated as for major surgery

### **Emergency Surgery**

- Communication is vital between surgical, haematology and anaesthetic teams to guide timing of surgery.
- Local guidance should be sought from haematology, but suggestions for timing of surgery is:
  - >12 hours for Dabigatran
  - >24 hours for Rivaroxaban and Apixaban.

Oral anticoagulants can be restarted at half dose 6 hours post op, provided there is haemostasis, and no ileus.

### **Central Neuraxial Block**

| <b>DRUG</b>        | <b>TIME FROM DOSE TO INSERTION/REMOVAL</b>                             | <b>TIME FROM INSERTION/REMOVAL TO NEXT DOSE</b> |
|--------------------|--|---|
| <b>Dabigatran</b>  | 2 days if creatinine clearance > 50ml/min.<br>5 days if CrCL <50ml/min | 2 hours following removal of epidural catheter  |
| <b>Rivaroxaban</b> | 22-26 hours  | 6 hours (24hr if traumatic puncture)            |
| <b>Apixaban</b>    | 26-30 hours  | 4-6 hours                                       |

|                     |             |            |
|---------------------|-------------|------------|
| <b>Fondaparinux</b> | 36-42 hours | 6-12 hours |
|---------------------|-------------|------------|

## Oxygen

Patients with an oxygen saturation of less than 96% on air should receive at least 2l/min nasal spec or 5l/min facemask oxygen. In the presence of severe pre-existing type 2 respiratory failure ortho-geriatric advice should be sought.

## Pacemakers and Implanted Cardioverter Defibrillators (ICDs)

A 12 lead ECG should be performed to establish pacemaker dependency.

A pacemaker check should have been performed in the last 12 months. The cardiology department keep records of all pacemaker checks and can usually confirm the date of the last check as well as the indication for pacing and programmed threshold (extension 44358).

In addition to ventricular defibrillation, ICD devices may incorporate pacing and atrial defibrillation functions. Cardiology should be contacted to establish the device functions and to arrange for the device to be programmed to “monitor only” mode per-operatively. They should also be available to convert back to the original programme function immediately after surgery. Patients should have defibrillator pads attached during the period when the device is “monitor only”, and the presence of a defibrillator capable of external pacing should be ensured. Pre-operatively attention should be paid to correcting anti-arrhythmic precipitants (metabolic derangement, hypoxia and hypotension). External defibrillation and anti-arrhythmic drugs should be readily available intra-operatively

Further guidance is available at:

[https://www.erbe-med.com/images/uk/Diathermy\\_Pacemakers-ICDs1.pdf](https://www.erbe-med.com/images/uk/Diathermy_Pacemakers-ICDs1.pdf)

## Renal Dialysis Patients

Have many other co-morbidities. As such other aspects of this guidance will be of relevance.

Operation on the day of haemodialysis should be discouraged as electrolyte and haemodynamic instability can occur. Ideally aim to operate the day after dialysis. There should be no delay in operating upon stable CAPD patients.

Up to date (and post haemodialysis) U&Es should be available. There will be an acceptance of lower haemoglobin levels (similar to those pre-fracture).

Good Hope Hospital has no haemodialysis facility. Patients here will require transfer to Heartlands for surgery.

## Steroids

Trauma and its subsequent surgery increase circulating cortisol as part of a “stress response.” For those patients taking steroids pre-operatively, the emphasis is to ***maintain*** glucocorticoid therapy and avoid supra-physiological dosing. Reducing time to theatre and minimising stress in the peri-operative period are just as important as steroid replacement.

For patients currently taking steroids < 10mg/day assume a normal hypothalamic-pituitary-adrenal response, so additional steroid cover should not be required.

For those taking >10mg/day maintain usual steroid dosage. In addition, administer 25mg hydrocortisone upon induction of anaesthesia and give 100mg/day of hydrocortisone in divided doses for 48hours post operatively. Recommence oral steroids on day 2 post operatively.

For those patients who stopped taking steroids < 3 months ago treat as if on steroids as above

For those who stopped > 3 months no peri-operative steroid cover is indicated.

Further information is available:

<http://patient.info/doctor/precautions-for-patients-on-steroids-undergoing-surgery>

## Warfarin (see also Novel Anticoagulents)

NOF patients admitted whilst on warfarin often have a prolonged INR on admission. The general consensus is that the INR should be 1.5 or less in order for surgery to proceed.

Passive cessation of warfarin whilst waiting for the INR to normalise can take 5 days. In addition, acute illness and the prescription of new drugs (e.g. NSAIDs or antibiotics) may also interfere with warfarin metabolism and delay the fall in INR.

*Therefore the following strategy is advised to bring the INR to 1.5 or less as soon as possible, allowing surgery to proceed whilst ensuring that the risk of thrombotic events is reduced to a minimum.*

Stop warfarin. Measure INR on admission. Commence prophylactic enoxaparin or unfractionated heparin s/c daily according to the VTE protocol. If the INR is 1.5 or less, proceed to surgery as planned.

If the INR is greater than 1.5, give vitamin K 2mg i/v stat on day 1. Measure the INR on day 2, which should be 1.5 or less.

In the unusual event that the INR remains >1.5, repeat steps 2 and 3. Once the INR is 1.5 or less, proceed to surgery as planned.

Post-operatively the ortho-geriatric team will determine the need and dosing to restart warfarin. Measure the INR daily. Once it is within the therapeutic range, (according to the initial indication for warfarin) enoxaparin/heparin can be discontinued.

**If there are any queries regarding the application of this protocol to a specific patient, please contact the on-call haematology SpR for advice in order to avoid any unnecessary delay to theatre.**

### **Points of Contact for advice or assistance**

#### **1. Trauma theatre anaesthetist**

At BHH available **all day** in trauma theatre for advice (ext 43292)

At Good Hope : AM contact emergency theatre (3) anaesthetist, extension 47553 PM  
contact trauma theatre (4), extension 49639

**2. Trauma anaesthetic lead** – Dr Matthew Gray, mobile via switchboard, email at [matthew.gray@heartofengland.nhs.uk](mailto:matthew.gray@heartofengland.nhs.uk) or departmental extension 43438.

#### **3. Orthogeriatric leads:**

Dr Govindarajan (BHH). Mobile via switchboard.

Dr Helen Chamberlain (GHH), mobile via switchboard, email at [helen.chamberlain@heartofengland.nhs.uk](mailto:helen.chamberlain@heartofengland.nhs.uk) or secretarial extension 49482.

**4. Trauma Matron** – Jane Wallace, pager 2027 or extension 40341.

**5. Anaesthetic Practitioner lead** – Kathleen Dixon, mobile via switchboard, email or departmental extension 49873.

