

# Modernising hip and knee replacement surgery

A new 'fast-track' protocol for hip and knee replacement surgery, designed to reduce post-operative complications, has been introduced at Northumbria Healthcare NHS Foundation Trust. This article describes the protocol and the involvement of the pharmacy team in its development.

A new 'fast-track' protocol for performing total hip replacement (THR) and total knee replacement (TKR) surgery has been developed at Northumbria Healthcare NHS Foundation Trust. The new protocol aims to reduce inpatient stay, post-operative complications and recovery time (see background box). It was implemented following similar work at the Golden Jubilee Hospital in Glasgow,<sup>2,3</sup> and has been adapted for the local population.

The fast-track protocol differs from traditional practice by adopting a holistic approach to surgery. It includes procedural and pharmacological modifications, and addresses behavioural influences. The pilot site for the protocol was Wansbeck Hospital in Northumberland. The key differences between the traditional and fast-track methods of THR and TKR surgery are summarised in Figure 1 (p344).

## Pre-operative therapy

Fast-track surgery has been introduced for all those requiring knee replacements,

hip replacements, hip resurfacing, unicompartmental knee replacements and patellofemoral replacements. Patients are pre-assessed for surgery by a nurse specialist. They are informed about the procedure and are issued with a prescription for gabapentin 300mg for neuropathic pain, to be taken the night before surgery. Patients who are already taking gabapentin or pregabalin for neuropathic pain management are not prescribed additional gabapentin and are advised to continue taking their medicine at the usual dose.

## During surgery

During surgery patients are given the following drugs:

- A target-controlled infusion of propofol for light anaesthesia (target blood concentration 1–2.5µg/ml)
- A single injection of prophylactic gentamicin 3mg/kg together with a second antibiotic (choice under review)
- A low dose spinal injection of 2–3ml 0.25% bupivacaine (plain) or 2ml 0.5% bupivacaine (heavy)
- Tranexamic acid 15mg/kg (slow intravenous bolus) to reduce bleeding



Patients undergoing 'fast-track' knee replacement surgery have reduced opioid requirements

## Background

Under traditional methods of joint replacement surgery (arthroplasty) patients are given opioid infusions via a patient-controlled analgesia (PCA) device or epidural administration alongside general anaesthetic agents. This can lead to post-operative nausea and vomiting,<sup>1</sup> which can be a significant limiting factor for patient recovery.

Epidural administration of opioids is labour intensive for nursing staff, requiring frequent patient observation and monitoring. Adverse effects include motor block, which prevents immediate mobilisation; and urinary retention, which requires patient catheterisation.

A certain level of knowledge is required in order for the patient to correctly use PCA devices containing opioids and the devices may not be appropriate for all patients.

Intrathecal opioids have the same problems as PCA devices and their duration of action is limited. There is also a risk of delayed respiratory depression.

Traditional methods of parenteral opioid administration require attachment of a device to the patient, preventing them from leaving the bedside.

The use of wound drains and urinary catheters also create a potential source for infection.

Patients may also receive ketamine as a 5mg/kg slow IV bolus; this can be repeated up to a total dose of 0.5mg/kg. The decision to use ketamine is made by the anaesthetist on a case by case basis. Paracetamol 1g IV, with or without diclofenac 75mg IV, can also be given to reduce pain and inflammation caused by the surgery.

No urinary catheter is used unless specifically indicated, for example if the patient develops urinary retention. Wound drains are not used during this technique, to prevent the loss of local anaesthetic.

Levobupivacaine 1.25mg/ml is administered by the surgeon for local anaesthesia: up to 100ml can be used for local infiltration. The wound catheter is inserted into the joint by the surgeon and is then attached to an infusion pump in the theatre recovery unit.

Traditional	Fast-track
Intra-operative general anaesthetic with spinal or epidural analgesia +/- nerve block	Gabapentin given the night before surgery. Low-dose spinal anaesthesia and light sedation are given during surgery
Standard urinary catheterisation +/- wound drain	Urinary catheterisation only if indicated. No wound drains
IV fluids given for 24 hours	Fluid and vasopressor use should be appropriate to estimated blood loss and clinical condition
No specific drug given to reduce blood loss	Tranexamic acid given in theatre to reduce blood loss
Mobilisation the day after surgery	Mobilisation 3–5 hours after surgery
Opiates given via a patient-controlled analgesia (PCA) device if intrathecal or epidural opiates are not given	Opiate use minimal. Oral oxycodone given for the first 1–2 days then stepped down to tramadol. No intrathecal, epidural or PCA opiates

Figure 1: Differences between traditional and fast-track methods of hip and knee arthroplasty

In the peri-operative period, the fluid regimen is tailored to the individual patient, considering co-morbidities, blood loss in theatre, blood pressure and renal function.

### On the ward

When back on the ward, patients are closely monitored while the spinal block reverses. Bladder function is monitored since patients do not have a urinary catheter *in situ*.

The combination of volume depletion, intra-operative non-steroidal anti-inflammatory drugs (NSAIDs) and gentamicin can affect renal function, so this must be closely monitored. This is particularly important in elderly patients or those with pre-existing renal impairment.

**Pain relief** Patients receive five 20ml bolus doses of levobupivacaine through the wound catheter. Intralipid 20% is available on the wards and in theatres as an antidote in case of overdose with the local anaesthetic. If the catheter falls out of position, parenteral opioids are offered, either as rescue doses of IV morphine or a PCA device containing morphine sulphate 1mg/ml in cases where pain is severe and uncontrolled.

Modified-release oral oxycodone 5–20mg BD is given. The starting dose is dependent on previous opioid use and patient age. Patients are monitored closely for pain using visual analogue scales. If pain worsens, morphine sulphate solution (10mg/5ml) 10–20mg can be used as breakthrough analgesia every two to four

hours, as required. Morphine sulphate solution was selected in preference to oxycodone solution as a first-line choice for breakthrough analgesia because only one nurse is required to administer it; two nurses are needed to administer oxycodone in accordance with local trust policy. Further breakthrough analgesia is available if pain continues despite administration of morphine sulphate solution. Patients are counselled by the pharmacy team and nursing staff to encourage the use of breakthrough analgesia before pain becomes established.

Post-operative analgesia is also provided by gabapentin 300mg BD for five days after surgery. Lower doses are used for patients with renal impairment. Oral paracetamol is prescribed at a dose of 1g QDS.

Patients undergoing TKR are issued with a Cryocuff (Aircast) device. This is an ice-chilled cuff that is applied to the joint, to provide comfort and minimise swelling of the limb.

**Thromboprophylaxis** In August this year, the Trust's thromboprophylaxis protocol was updated to include the use of rivaroxaban for prevention of venous thromboembolism after THR and TKR in adults, following recommendations from the National Institute for Health and Clinical Excellence.

In the absence of contraindications, rivaroxaban 10mg is administered as a daily oral dose, given at 8am the day after surgery, in addition to the use of class I graduated compression stockings. Patients

with a history of previous deep vein thrombosis (DVT)/pulmonary embolism post-surgery are prescribed rivaroxaban, starting on the evening of surgery, but no sooner than six hours after the operation. The duration of rivaroxaban therapy should not exceed 35 days in patients undergoing THR, or 15 days in those undergoing TKR.

Prior to implementation of the new recommendations, patients were given subcutaneous tinzaparin (a low molecular weight heparin) for 28 days following THR or TKR to prevent DVT. It is hoped that rivaroxaban will improve patient compliance and satisfaction; reduce the nursing time burden associated with giving injections; reduce blood monitoring costs required to prevent heparin-induced thrombocytopenia following tinzaparin administration; and reduce the need for district nurse intervention for patients who are unable to self-administer subcutaneous injections.

**Other interventions** To aid sleep and reduce fatigue, zopiclone 3.75mg–7.5mg may be prescribed for one to two nights. Zopiclone is not suitable for some patients, e.g. those taking other sedating medicines. The ward pharmacist advises the prescribing doctor about which patients may not be suitable for a sedative.

### On discharge

Once the oxycodone course has finished, patients are prescribed tramadol 50–100mg QDS (dependent on age) as a step-down of analgesia prior to discharge from hospital. Paracetamol 1g QDS is also issued on discharge and an NSAID can be given if there are no contra-indications. Laxatives are also prescribed if needed.

Patients receive early mobilisation therapy with the physiotherapist after surgery, to help ease pain and reduce stiffness in the joint. Patients see the physiotherapist twice daily. Occupational therapists also provide a full assessment prior to discharge.

### Benefits

The fast-track surgery has several benefits over the traditional method:

- Using propofol for light anaesthesia instead of older anaesthetic agents reduces post-operative nausea and vomiting.<sup>1</sup>

- Using a low dose spinal analgesic without an opioid reduces the risk of delayed respiratory depression; it also reduces the risk of peri-operative hypotension.
- Early regression of a spinal injection increases the speed of recovery in preparation for physiotherapy on the ward.
- Using local infiltration techniques and infusion of local anaesthetics leads to reduced opioid requirements, as does the use of gabapentin and paracetamol. Gabapentin relieves neuropathic pain, which can be problematic in orthopaedic surgery.<sup>4</sup>
- Administration of modified-release oxycodone post-surgery provides early relief from pain, followed by maintenance of analgesia for up to 12 hours.<sup>5</sup>
- The reduced amount of medical equipment required after surgery, including PCA machines, epidural pumps and urinary catheters, means that the patient is free to leave the bedside to begin physiotherapy.

Because of the success of fast-track surgery at Wansbeck Hospital, two other sites within the trust (North Tyneside and Hexham) also implemented the protocol in May 2008. To date, over 1,200 patients have experienced the fast-track surgery regimen. During this time, the average length of stay at Wansbeck Hospital for a patient undergoing a THR has decreased from six days in 2002 to a median of three days during May 2008 to May 2009.

## Problems

The incidence of acute renal failure has increased from 0.1% with the traditional method to 0.7% since the implementation of the fast-track protocol. Possible causes include the additive effects of: judicious fluid replacement; the use of gentamicin plus concomitant nephrotoxic medication; and the use of NSAIDs. These factors are currently being reviewed.

Other issues include an apparent increase in infection rates, the cause of which has not yet been established. In the early phase of the pilot study, dexamethasone was given as a 10mg *statim* dose prior to surgery as an anti-inflammatory/anti-emetic agent, but concerns were raised about the effect of corticosteroid-induced delayed

wound healing and immunosuppression. Dexamethasone was removed from the protocol as a precaution.

## Role of the pharmacist

The pharmacists in the surgical team were involved in the initial development of the protocol, with a particular role in influencing the choices of recommended drugs and the practical aspects of setting up the service. Pharmacists have also had several opportunities to contribute to the roll out of the fast-track surgery protocol since its implementation.

Another significant role for pharmacists is the review of prescribing practice. The surgical pharmacy team plays an important role in ensuring that prescribing adheres to the protocol, and highlights omissions of usual medicines or fast-track drugs from the drug chart.

**Prescribing** Some of the pharmacists in the team are independent prescribers. They prescribe essential fast-track drugs, additional appropriate medicines (including laxatives, anti-emetics or analgesics) and also provide prompt medicines reconciliation. Using the Trust's policy regarding the use of drugs in the peri-operative period, independent prescribers make adjustments to patients' usual medication to prepare them for surgery and can omit medicines, such as nephrotoxic drugs, prior to surgery.

**Monitoring and counselling** Monitoring patients for signs of renal failure and side effects of the fast-track medicines has led to important interventions relating to drug use. Pharmacists on the surgical wards have also been involved in counselling patients taking newly initiated medicines. Pain control has been regularly reviewed to ensure that sufficient analgesia has been made available.

The turnover of patients has been more rapid since patient stay has reduced, requiring new ways of working to be developed, including a greater use of pharmacy technician skills. Drug histories are checked urgently on admission to the orthopaedic ward to determine any drug changes since the initial pre-assessment drug history.

Since the implementation of the fast-track protocol, the importance of the pharmacy input has become recognised by others in the clinical team.

## Next steps

Independent pharmacist prescribers will soon be involved in pre-assessment clinics. They will prescribe fast-track protocol drugs prior to admission as well as the patient's usual medication. Pharmacy technicians will be responsible for taking drug histories. These steps aim to reduce missed doses of medicines and to improve the efficiency and accuracy of prescribing on the wards.

## Conclusions

The introduction of the fast-track protocol for arthroplasty has several benefits to the NHS compared with the traditional method. These include shorter hospital stays, reduced costs, fewer complications and greater patient satisfaction. The protocol is in an early phase at the Trust and more work is necessary to optimise the regimen.

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