



West Yorkshire  
Major Trauma Network

**PAIN MANAGEMENT  
IN  
MAJOR TRAUMA PATIENTS**



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## PRINCIPLES

- All trauma is painful and management of pain is a critical part of trauma care.
- Untreated or inadequately treated pain intensifies the effect of trauma on respiration, hemodynamic stability, and renal and gastrointestinal function, leading to an increase in complications and deaths.
- The treatment of acute pain is also essential to facilitate recovery from trauma by enabling early mobilisation and avoiding complications such as the bed-bound risks of venous thromboembolism, pulmonary embolus, pressure sores and pneumonia.
- Poorly treated acute pain can also cause disabling chronic pain syndromes as the result of changes in the nervous system in response to repeated stimuli. There is a high prevalence of pain after trauma. One US study reported a prevalence of 62% 12 months after the trauma<sup>1</sup>.
- Principles of pain management in trauma include
  - Early initiation of appropriate treatment
  - Aggressive use of multimodal therapy
  - Treatment of the underlying cause
  - Assessment and management of psychosocial factors that may affect treatment or contribute to development of chronic pain

## SCOPE OF THIS GUIDELINE

- This guideline covers the assessment and management of pain in the adult major trauma patient population in the ED, theatres and the major trauma ward.
- This guideline should be used in conjunction with
  - Acute Pain Management in Adults manual (LTHT)
  - Clinical Practice Guideline for Assessment, Treatment and Documentation of Acute Pain in Adults (LTHT)
  - Medicines Code (LTHT)
  - Injectable Medicines Code (LTHT)
  - Clinical Practice Guidelines for the Assessment, Treatment and Documentation of Acute Pain in Adults
  - Adult Acute Pain Management Analgesic Ladder & Table.
  - Prescription and Administration of Strong Opioid Analgesia for the Management of Acute Pain in Adults
  - Prescription and Administration of a Patient Controlled Analgesia system (PCAS) for the Management of Acute Pain in Adults
  - Delivery of Epidural and Paravertebral Analgesia in Adult Acute Pain Management
  - Clinical Practice Guidelines for the Delivery of Continuous Local Anaesthetic Wound Infusions for Postoperative Pain Relief in Adults.

## PREVALENCE OF PAIN IN TRAUMA PATIENTS IN ED

- 91% patients with trauma present to the ED with pain
- Up to 15% of trauma patients receive inadequate analgesia and the mean time of getting pain relief is 60-90 minutes after the event
- Older patients are 12% less likely to be given pain medication than younger patients even when pain levels are the same
- As many as 2/3<sup>rd</sup> of the trauma patients leave ED without their pain being adequately



controlled

- In one US study pain decreased in 37% of the patients, did not change at all in 46%, and actually increased in 17% of the patients at discharge from the ED<sup>2,3</sup>

### Barriers to Pain Management in Trauma Population

- Fear of masking injuries
- Fear of impacting hemodynamic status
- Fear of respiratory compromise
- Lower priority compared to resuscitation and stabilisation
- Underuse of effective analgesic techniques
- Lack of pain protocols/order sets
- Lack of pain management knowledge by providers
- 40 to 60 per cent of trauma patients have other substances present on admission.
  - Alcohol.
  - Street drugs
  - Prescription medications: i.e. Strong opioids

Presence of these substances may modify administration of analgesics.

### Factors associated with the development of persistent pain after Trauma<sup>4,5</sup>

- ▶ Younger age
- ▶ Multiple surgeries
- ▶ Poorly managed acute pain
- ▶ Nerve injury
- ▶ Duration of disability (time to return to work)
- ▶ Psychological - ↑ anxiety, depression, stress

Injury/related Surgery	Incidence of persistent pain
Amputation	30-85%
Thoracotomy/Chest Wall	5 - 67%
Spinal Cord Injury	> 50%
Traumatic Brain Injury	32 – 51%
Vertebral fractures	> 25%
Burn Injuries	35- 52%
Complex Regional Pain	1-5%

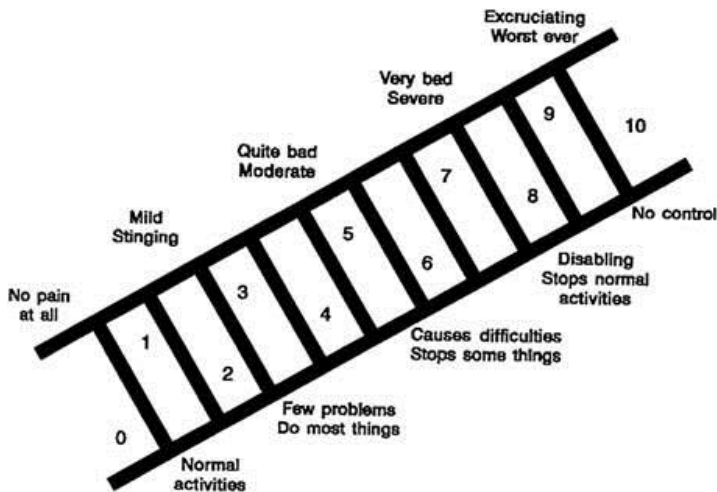
### ASSESSMENT OF PAIN

There are several scales for pain assessment such as numerical pain scale and the 0-10 scale. Please refer to the [Clinical Practice Guidelines for the Assessment, Treatment and Documentation of Acute Pain in Adults](#), which incorporates the [Adult Acute Pain Management Analgesic Ladder & Table](#).

The scales recommended for use in LTHT for adults are



## ED: Triage Pain Ruler



**Ward:** 0-3 pain intensity score, where 0 is no pain and 3 is worst possible pain.

### Caveats in pain assessment

- All Pain scales are subjective and there is wide variation between individuals for a similar degree of trauma
- Age, sex, ethnicity can affect pain perceptions
- Pain management is challenging in patients with pre-existing pain problems

## PAIN MANAGEMENT<sup>5</sup>

### PREHOSPITAL ANALGESIA<sup>6</sup>

- Most patients should have been given some form of pain relief before reaching hospital. This will depend on the skills and experience of the pre-hospital staff and local protocols. *Check what has been given in the field before topping up pain relief.*
- Morphine is the first line analgesic for major trauma, patients may have been given up to 10 mgs in the field.
- Entonox may have been used for moderate pain.
- If the pre-hospital team has a physician, patients may have been given ketamine.
- Oral medications such as paracetamol/NSAIDs/codeine are unlikely to have been administered in the major trauma population.

### EARLY PAIN MANAGEMENT IN ED

Aggressive use of multimodal therapy in all stages

- Assess patients pain on presentation to ED using appropriate tools
- **Morphine iv** is the gold standard for pain relief in trauma. 2-5mgs may be given at 5-minute intervals, titrated to the patients' pain scores.
- **Ketamine** is a useful adjunct for pain relief in doses of 0.1-0.3mgs/kg. Ketamine may depress level of consciousness and cause delirium, which may complicate the clinical picture. This is unlikely in the doses suggested above. Ketamine also modifies the pain



response, reduces opioid requirement and has been suggested to prevent development of chronic pain.

- Shorter acting opioids such as **fentanyl and alfentanil** may be used for rapid pain control. These can depress ventilation and hence should only be used by anaesthetists with competency in airway management and familiarity with their use.
- **Paracetamol** may be given iv and is a useful adjunct to other stronger drugs.
- NSAIDs do not normally have a role in major trauma due to their deleterious effects on coagulation.
- **Splinting** of broken bones will aid in pain relief.
- **Peripheral nerve blocks.** These may be performed for specific conditions as detailed below, by trained personnel (ED doctors or anaesthetists), with full monitoring and under sterile conditions. The drug of choice is 0.25% bupivacaine to a maximum of 2mg/kg. This analgesic option will have limited duration (approximately 6-8 hours), so additional analgesia will need to be implemented thereafter.
  - Femoral nerve block or fascia iliaca block: fractures of the femur
  - Brachial plexus blocks: upper limb injuries
  - Intercostal nerve blocks: rib fractures
- Reassess pain scores at regular intervals and top up pain relief as needed

## THEATRES

### Surgical options:

Surgical fixation of fractures, internal or external, in itself aids pain relief.

### Anaesthetic options:

There are several options for pain relief in theatre; these will depend on the experience and preference of the individual anaesthetist.

- **Continuous opioid infusions**-most polytrauma patients will be managed on a continuous opioid infusion, usually of remifentanyl, an ultra-short acting opioid. This provides excellent operative analgesia, but is not useful post operatively due to its very short (few minutes) duration of action.
- **Peripheral nerve blocks (PNB)**-single shot or continuous catheter techniques: There may be concerns with the use of PNBs in operative fixation of long bone fractures, especially in the case of high impact lower limb fractures. These fractures are at high risk of developing **compartment syndrome**, a devastating complication, the cardinal symptom of which is pain disproportionate to the injury. The worry is that the pain of compartment syndrome will be masked by the regional anaesthesia.  
However, pain is an unreliable indicator of compartment syndrome<sup>7</sup>, being subjective and inconsistent. In established compartment syndrome, pain may even be absent. There is no convincing evidence that regional analgesia delays the diagnosis of compartment syndrome, provided patients are adequately monitored. In patients with high risk of developing compartment syndrome, there should be a practice of regular assessment, a high index of clinical suspicion and compartment pressure measurements, irrespective of the analgesic method.  
The decision for the PNB should be made after discussion with the operating surgeon.



- **Central neuraxial blocks**-spinal or epidural analgesia for lower limb trauma. Central neuraxial blocks are not first line in major trauma for several reasons. Patients may have associated injuries which makes positioning for epidurals difficult. There may also be high risk of coagulation abnormalities if patients have had a massive transfusion. They may be used for subsequent surgery.
- **Paravertebral blocks** for rib fractures-in case of thoracic injuries where a thoracotomy has been done, the surgeons will be able to insert paravertebral catheters under direct vision and these may be used to provide post-operative analgesia via a local anaesthetic infusion.
- **Wound infusion catheters**- these are surgically inserted catheters, which are then connected to an infusion of local anaesthetic, usually bupivacaine. In the trauma scenario, they are mostly used after limb amputations where they provide good quality pain relief. An initial bolus of 0.25% bupivacaine between 0.5-2mgs/kg is given, followed by an infusion rate of not more than 0.5mgs/kg/hour of bupivacaine. For more details, see [Clinical Practice Guidelines for the Delivery of Continuous Local Anaesthetic Wound Infusions for Postoperative Pain Relief in Adults](#).
- **Medication**
  - **Ketamine**: this is a non-competitive NMDA receptor antagonist, which inhibits the release of excitatory neurotransmitters and provides analgesia, amnesia and anaesthesia. It has a rapid onset of action in about 1 minute and lasts for 5-15 minutes. There is some evidence that it modifies the pain response, reduces opioid requirement and limits development of chronic pain<sup>8,9</sup>. These effects of ketamine last long after the direct effects have worn off. Ketamine is thus a useful drug in the severely injured patients, as they need high doses of opioids and have a high chance of developing chronic pain. Dose: 0.1-0.5mgs/kg.
  - **Clonidine**: this is an alpha 2 adrenoceptor agonist and works by enhancing the release of inhibitory neurotransmitters. It has potent analgesic and opioid sparing effects in doses of up to 3microgrammes/kg. Side effects are sedation, hypotension and rebound hypertension<sup>10</sup>.
  - **NSAIDS**: NSAID use is controversial in bone trauma, as they have been shown to delay bone healing in high doses in animal models. Their anti-inflammatory properties may suppress the inflammation needed for bone healing. There are no good quality studies in humans. There are studies to say that NSAID administration should be considered as a risk factor for delayed fracture healing equal to smoking, corticosteroids or diabetes<sup>11</sup>. A suggested protocol is that NSAIDS may be used in normal doses for durations of less than one week in patients with low risk of fracture non-union.

## WARDS

The acute pain team and the anaesthetists should be actively involved in the pain management of major trauma patients, which can often be challenging and may need individualising. The major trauma ward L22 at the LGI has advanced nurse practitioners (ANPs), who are experienced in pain management in this group of patients and are able to prescribe analgesia



including opioids and PCAS as required. They can manage most cases independently. Patients whose pain is not well managed by usual means will be referred to the Acute Pain Service or anaesthetists by the ANPs.

## MODES OF PAIN MANAGEMENT ON WARD

### PCAS

- Due to multiple site injury, most major trauma patients are prescribed an opioid PCAS. Refer to the trust guidance; [Prescription and Administration of a Patient Controlled Analgesia system \(PCAS\) for the Management of Acute Pain in Adults](#). Ensure the infusion is prescribed on a trust approved PCAS prescription chart and that an observation chart to assess safety and efficacy of pain management is completed.
- A non-standard PCAS may be used for those patients with challenging pain requirements eg. Opioid tolerance, IV drug abuse and those with pain not adequately controlled with a standard PCAS. A non-standard PCAS may be either
  - A higher bolus dose of morphine 1.5-2mgs with a 5 minute lockout
  - A morphine background infusion (currently only in an HDU environment)
  - Oxycodone instead of morphine (if unacceptable side effects with morphine e.g hallucinations)

All non-standard PCAs should be referred to the acute pain team for follow-up.

- The PCAS may be taken down after an appropriate interval, which is determined by the patients' opioid use via the PCAS (as a rule of thumb, if the PCAS use is less than 30mgs of morphine in 24 hours, it may be taken down). It is inappropriate to take down the PCAS if the morphine use is high; in such cases it may be difficult to provide adequate analgesia with oral drugs only.
- After the PCAS has been taken down, the patient should then be started on oral pain therapy as per the WHO pain ladder. Oral immediate release morphine should be prescribed as the first line rescue agent.
- Sustained release opioids (MST, Oxycontin)
  - The pharmacokinetic profile of sustained release opioids is such that they take 48-72 hours to reach steady state plasma concentration and provide adequate pain relief. Hence they are not the first choice drugs in acute pain management.
  - Sustained release oral opioids should be used with caution in the ward environment, with recognition that this is akin to setting up a background infusion on the PCAS and may need a higher level of monitoring, depending on the patient and the doses used.
  - Discussion with the Acute Pain Service will be prudent prior to commencing sustained release opioids and all patients on sustained release opioids should be referred to the pain team for follow up.





- Algorithms for administration of intravenous, intramuscular, subcutaneous and oral preparations of morphine and PCAS can be found on the trust intranet.
- A suggested protocol for use of sustained release opioids on L22 is given below in Appendix 1

## EPIDURAL AND PARAVERTEBRAL ANALGESIA

Currently this form of analgesia can only be administered on HDUs.

- **Epidural catheters**
  - An epidural catheter provides excellent analgesia but may be difficult to insert acutely in the multiply injured patient and contraindicated in the trauma patient with coagulation abnormalities. They are most likely to be used for second stage surgery and reconstructions.
- **Paravetebral catheters**
  - These are particularly useful for chest wall trauma (see Guidance for Management of Chest Wall Trauma)
- All epidurals and paravertebral catheters should be clearly labelled and the drug dosages prescribed on a trust approved epidural/paravertebral prescription and observation chart. The patient details should be registered on the APIS epidural database so that the acute pain team can follow ups.

## PERINEURAL CATHETERS AND LOCAL ANAESTHETIC INFUSIONS

- Continuous local anaesthetic wound infusion has been shown to be effective in management of pain relief and reduces morphine requirements.
- Surgical placement of a catheter in the subcutaneous tissues or perineural sheaths can offer good analgesic benefit. Refer to the [Clinical Practice Guidelines for the Delivery of Continuous Local Anaesthetic Wound Infusions for Postoperative Pain Relief in Adults \(LTHT\)](#). If you are in a trauma unit, please follow local guidelines.
- A bolus dose of 0.25% Levobupivacaine is administered down the catheter and an infusion prescribed at an hourly rate, not exceeding 0.5mg/kg/hr.
- All local anaesthetic wound infusions should be delivered via a trust approved elastometric infusion pump and prescribed on the trust [Bupivacaine 0.25% Local Anaesthetic Wound Catheter Prescription Chart \(LTHT\)](#). If you are in a trauma unit, please follow local guidance.
- Regular observations are needed as detailed in the prescription chart; these are in addition to routine NEWS observations.

## OTHER PHARMACOLOGICAL TREATMENTS

The use of additional pharmacological agents may be useful in this group of patients as pain can be severe and there is often a neuropathic element. If patients have definite nerve injury



and/or demonstrate neuropathic symptoms such as burning pain, allodynia, hyperalgesia, etc, they should be prescribed these medications with advice from the acute pain team.

All patients should be on regular *paracetamol* unless contraindicated.

- **Gabapentin** is the first line treatment for adult neuropathic pain. Start with 300mg once daily and titrate up to 300mg three times a day, over three days. The dose should be titrated more slowly in the elderly and reduced in renal impairment. The maximum dose is 1200-3600mg per day (divided into three doses). Contraindicated in pregnancy & breastfeeding.
- **Pre gabalin** is licensed for peripheral & central neuropathic pain. Commence at 150mg a day in two or three divided doses. Slowly increase to a maximum of 600mg. Reduce dose in renal impairment. Contraindicated in pregnancy & breastfeeding.
- **Amitriptyline** is an antidepressant widely used for neuropathic pain. Commence at 10-25mg once a day. Slowly increase to a maximum of 75mg/day.
- **Clonidine** is an alpha-2-adrenoreceptor agonist. This can be administered orally or subcutaneously at a dose of 50microgrammes three times a day.
- **Ketamine** may be given as a low dose infusion in severe pain resistant to opioids. It may be given along with opioids. In the low doses used, respiratory depression is unlikely and hallucinations and dysphoria are uncommon. This is only for specialist use in an HDU environment by the acute pain team.

#### SPECIFIC LONG-TERM ISSUES IN MAJOR TRAUMA PATIENTS

- Need to assess and manage psychosocial factors that may confound treatment or contribute to development of chronic pain. Those at risk are patients with pre-existing substance abuse and pre-existing chronic pain. These patients must be referred early to the acute pain team.
- Psychological support should be provided to these patients from an early stage. They should be educated about their condition, which has been shown to minimise apprehension and enables earlier return to normal function.
- Regular physiotherapy to maintain muscle strength.
- Occupational therapy to encourage early return to normal activity.
- Rehabilitation measures to be started ASAP.

#### Further Reading / Resources

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## APPENDIX 1

### PROTOCOL FOR USE OF SUSTAINED RELEASE OPIOIDS ON L22

#### Indications for use of sustained release opioids

- Patients who have been stepped down from a PCAS but are requiring >60mgs of immediate release morphine in 24 hours PRN to control pain.
- Patients who do not have a PCAS but are requiring >60mgs of immediate release morphine in 24 hours PRN to control pain.
- Patients unable to use a PCAS (e.g. bilateral upper limb trauma) and requiring >60mgs of immediate release morphine in 24 hours PRN to control pain.

#### Patients under 70 years of age:

- Morphine sulphate MR capsules (e.g. Zomorph) 20mg at 0800 hours and 2000 hours.
- **And** Oral morphine solution (10mg/5mL): 10mg 2-4 hourly as required for breakthrough pain to a maximum dose of 60mgs in 24 hours.
- Review MR morphine prescription at least every 24 hours. Before escalating dose, bear in mind that it may take 48-72 hours for sustained release opioids to reach steady state and provide adequate analgesia. In the meantime, patients may need increased doses of immediate release morphine.
- If the patient has required 3 or less breakthrough doses of oral morphine (30 mgs), the sustained release morphine sulphate can be halved or patient changed to alternative analgesia, such as tramadol or dihydrocodeine.

#### Patients under 70 years of age with morphine intolerance:

- Oxycodone sustained release (Oxycontin) tablets 10mg at 0800 hours and 2000 hours.
- **And** immediate release Oral oxycodone (oxynorm): 5mg 2-4 hourly as required for pain to a maximum dose of 30mgs in 24 hours.
- Review oral oxycodone prescription at least every 24 hours. If the patient has required 3 or less breakthrough doses of oral oxynorm, the sustained release oxycodone can be halved or patient changed to alternative analgesia, such as tramadol or dihydrocodeine.

#### Special considerations

- Patients whose pain is not controlled by the above regime: seek advice from Acute Pain Team or senior medical staff before increasing the dose of sustained release drugs.
- Patients over 70 years of age: these group at higher risk of side effects such as respiratory depression with strong sustained release opioids. They may be better managed by PCAs or by weaker opioids. Advice may be sought from the acute pain team if this proves inadequate.

#### Monitoring

All patients receiving strong oral opioids must have pain, sedation and nausea scores, and respiratory rate recorded and assessed at regular intervals. The Acute Pain Service or senior ward medical staff must be informed of any concerns.



### **Discharge Advice**

Some patients may require these strong opioids for longer periods of time but should not be discharged home with them unless specified by senior medical staff or Acute Pain Service. Analgesia should be reviewed daily to avoid unnecessary discharge prescriptions.

The patients GP should be informed in any patient is discharged with a sustained release opioid prescription. In addition, these patients should have a plan for tapering and stopping these opioids.