GIG CYMRU NHS WALES | Bwrdd Iechyd Prifysgol Caerdydd a'r Fro | Cardiff and Vale University Health Board	**Reference Number: UHB 011** **Version number: 4** **Date of next review: November 2026** **Previous Trust/LHB Reference Number: Trust 189 UHB Version 1&2**

Acute Pain Management Guidelines (Adult)

Introduction

These guidelines relate to adult acute pain management. They aim to facilitate safe practice and manage the risks associated with the pain-relieving strategies utilized.

Aim

These guidelines have been produced to ensure that consistent, safe and appropriate evidence-based acute pain management is provided for adults throughout Cardiff and Vale University Health Board.

Objectives

To promote safe practice that is evidence based and standardised within the clinical areas. To provide clinical areas with appropriate pain management support and education.

Scope

This procedure applies to all working in adult areas UHB wide.

Equality Impact Assessment	*An Equality Impact Assessment has, been completed. The Equality Impact Assessment completed for the guideline found there to be no impact.*
Documents to read alongside this Procedure	**The most RECENT British National Formulary**
Approved by	Perioperative Quality and Safety Committee
Accountable Executive or Clinical Board Director	Clinical Director Anaesthetics
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Disclaimer
Review date of this document has passed please ensure that the version you are using is the most up to date either by contacting the document author or the Governance Directorate.

Summary of reviews/amendments			
Version number	Date of Review Approved	Date Published	Summary of Amendments
1	25/10/2010	14/03/2011	Inclusion of information relating to oral anti-coagulant rivaroxaban and epidural catheter removal (sections 5.6 and 5.9
2	27/03/2013	17/10/2013	**NSAIDs** - Ibuprofen now indicated as 1st line NSAID naproxen 2nd line and diclofenac only to be used if the rectal route is the most appropriate route of administration. **NOTED: MHRA Drug Safety Update- Diclofenac** contraindications and warnings relating to cardiovascular safety. Indicated within text and update included as appendices. **Oxynorm** -removed **Pethidine-** removed **Epidural section** - further clarification and detail around the removal of the epidural catheter and consideration relating to anti- platelet and anti-coagulant therapies. **Care plans** – Intravenous PCA, epidural, intrathecal, ketamine and peripheral infusion of local anaesthetic care plans have been indented in the relevant sections of the guidelines. These outline monitoring requirements, potential problems and how to manage them.

3	16/7/2015	26/10/2015	**Section 5: Epidural analgesia:** Changing the Gemstar epidural infusion device to the McKinley Bodyguard. Removal of epidural care plan and replaced with Epidural and Regional Local Anaesthetic Infusion **Care plan Section 12: Ketamine protocol -** ketamine to esketamine with care plan changes too. **NB Ketamine (Ketalar)** is no longer readily available in the UK. Ketamine is a racemic mix of two isomers and the alternative esketamine only contains the 'S' isomer of ketamine and is therefore twice as potent. **Section 12: Regional infusion of local anaesthetic** (Regional analgesia) – re-named the protocol. Removal of peripheral infusion of local anaesthetic care plan and replaced with Epidural and Regional Local Anaesthetic Infusion Care plan

4	24/11/2023	24/11/2023	**NEW SECTIONS:** **Section 1** - Introduction of a Mission Statement **Section 2** - The principles of postoperative pain management **Section 5** – Ketamine Infusion Esketamine has been withdrawn from UK. This section details the conversion to Ketamine. **Section 8 -** Lidocaine infusion **Section 9 -** Management of Blunt Chest Trauma/Rib Fractures **CHANGES TO EXISTING SECTIONS:** **Section 3 -** PCA Introduction of new PCA devices. **Section 4** – New guidance included from the Royal College of Anaesthetists. **Section 4-** Changes of prefilled bags for epidural analgesia to mixed bag of fentanyl 2mcg/ml with levobupivacaine 1mg/ml (0.1%)- 500ml container and local only infusion of levobupivacaine 1.25mg/ml (0.125%) 200ml container. **Section 4-** Changes on advice from Microbiology around which antibiotics to use for suspected or confirmed epidural site infection **Section 4-** Epidural section - further clarification and detail around the removal of the epidural catheter and consideration relating to direct oral anti-coagulants (DOACs) and oral anti-coagulation therapies and anti-platelets. Updated local anaesthetic toxicity

			guidance from AAGBI 2023. **Section 5** - Updated local anaesthetic toxicity guidance from AAGBI 2023. **Section 5-** Changes to pre-filled regional continuous analgesia to levobupivacaine 1.25mg/ml (0.125%) **Section 11 –** New Hourly Administration of Opioid Algorithm. **Section 14 –** Changes of Entonox Prescription

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Section 1

ACUTE PAIN SERVICE MISSION STATEMENT / SERVICE PROVISION

The service aims to ensure that adult patients with acute pain are managed safely, effectively and appropriately using evidence-based pain management practices in the in-patient clinical environment.

Mission statement

'Our goal is to achieve excellence in providing safe,
effective and efficient management of pain'.

What we provide

- Expert specialist knowledge.
- Liaison between multidisciplinary team members to optimise management of acute pain.
- Assessment of pain.
- Sophisticated methods of pain relief (incl. epidural analgesia, PCA, intrathecal opioids, local anaesthetic blocks, ketamine and lidocaine infusions etc).
- Management of peri-operative patients, those with blunt chest trauma and complex acute pain management problems.
- Audit and research projects.
- Support for patients and their families.
- Information giving.
- Education for Cardiff and Vale University Health Board (C&V UHB) multidisciplinary team members.

Contact details for pain management referrals

Between 08.00-20.00hrs, Monday – Friday and 08:00-15:30hrs on the weekends the Acute Pain Service should be contacted on Bleep 5414. Outside of these times, contact the on-call Obstetric Anaesthetist, on Bleep 5101.

Section 2 – THE PRINCIPLES OF POST-OPERATIVE PAIN MANAGEMENT

Definition of terms

- "Pain is whatever the experiencing person says it is, existing whenever the experiencing person says it does" (McCaffery, 1989)
- "Pain is an unpleasant sensory and emotional experience, associated with or resembling that associated with, actual or potential tissue damage" (IASP, 2020)
- Acute pain (nociception) is associated with tissue damage and an inflammatory response, it is self-limiting and of short duration.
- Pain assessment is a multidimensional observation of a patient's experience of pain.
- Pain measurement tools are instruments designed to measure pain.

Consequences of unrelieved pain

Unrelieved pain has undesirable physical and psychological consequences that can have an effect in both the short and longer term. Physiological responses include increased heart and blood pressure.

Psychological consequences include:

- Anxiety, fear, distress, feelings of helplessness or hopelessness.
- Avoidance of activity or medical procedures in future.
- Sleep disturbance.

Failure to relieve pain produces a prolonged stress state, which can result in harmful multisystem effects. There is also evidence that acute (post-operative) pain can result in chronic pain in a small but significant number of people. Other unwanted effects of unrelieved pain include:

- Prolonged hospital stays.
- Increased rates of readmission to hospital.
- Increased number of outpatient visits.

Individuality of pain perception

Pain is the most common symptom people experience in hospital; hence nurses are in a unique position to assess pain as they have the most contact with the patient and their family.

The influences that may alter pain perception and coping strategies include social history, cultural and religious beliefs and past pain experiences. In addition, family response to their relative's pain can have a negative or positive influence.

In addition, consideration should be given to:

- The cause of the pain (e.g. post-operative, trauma, cancer).
- The patient's cognitive ability.
- The environment (e.g. hospital).
- The patient's level of anxiety

Pain assessment

Pain is multidimensional therefore assessment must include its intensity, location, duration and description. Pain assessment is thus crucial for pain management to be effective.
Pain measurement quantifies pain severity and enables the nurse to determine the efficacy of interventions aimed at reducing pain. Points to consider:

- Pain history
- Location of pain
- Intensity of pain

Pain assessment is the first step in ensuring pain is managed effectively (Figure 1) and if pain is not assessed (and documented), it is difficult to evaluate the effectiveness of any pain-relieving interventions and decide whether further action is needed.
For further patient information refer to the British Pain Society- Managing pain after your surgery.

Managing Pain after Surgery

Pain assessment tools

Tools used for pain assessment are selected on their validity, reliability and usability and are recognised by pain specialists to be clinically effective in assessing acute pain. All share a numeric scale, recorded as values 0-10 (0-18 for the Adapted Abbey Scale) and should be documented on the clinical observation chart. The importance of using the numeric value is that the number relates to the same pain intensity in each tool.

Pain is a subjective experience, so individual self-reporting is the preferred method for assessing pain. A tool that incorporates physical, behavioural and self-report can also be used where necessary. Physiological indicators in isolation cannot be used as a measurement for pain. However, in certain circumstance (for example, the ventilated and sedated individual) physiological indicators of pain can be helpful to determine a patient's experience of pain. These include:

- heart rate may increase
- respiratory rate and pattern may shift from normal i.e. increase, decrease or change pattern
- blood pressure may increase
- oxygen saturation may decrease

Three ways of measuring pain are:
- Self-report – what the person says (the gold standard)
- Behavioural – how the person behaves
- Physiological – clinical observations

There are four main tools used for pain assessment in the adult patient (**APPENDIX 1**). These tools reflect a combination of self-reporting and behavioural assessments:

- Categorical Scale (No pain, mild, moderate, severe)
- Numerical Scale (0-10)
- PainAD Scale
- Adapted Abbey Scale

Choose an appropriate Pain Assessment Tool based on your clinical assessment of the person's understanding and needs. Consider factors such as confusion/delirium, language barriers, cognition or comprehension.

- For patients who can verbalise their pain, it should be assessed using one of the self-reporting verbal rating scales (categorial or numerical) which is in use in your clinical area.
- For patients who are unable to verbalise their pain, use either Adapted Abbey or PainAD pain assessment tools.
- For critically ill patients who are unable to self-report, use behavioural pain assessment tools, as vital observations in the critically ill adult are not a valid too for measuring pain. Because the nature of the critical illness or medications/infusions being given will mask the physiological signs of pain i.e. sepsis, trauma, inotropes, brain injury, neuromuscular agents and deep sedation. Vital observations can be used as a prompt that pain assessment should be done but not form the basis of assessment. Instead, the Behavioural Pain Scale or Critical Care Pain Observation Tool should be used (Cade 2008).

Please note, this can change during an admission based on the patient's clinical presentation.
It is important to assess pain **on deep breathing, movement and/or coughing.**

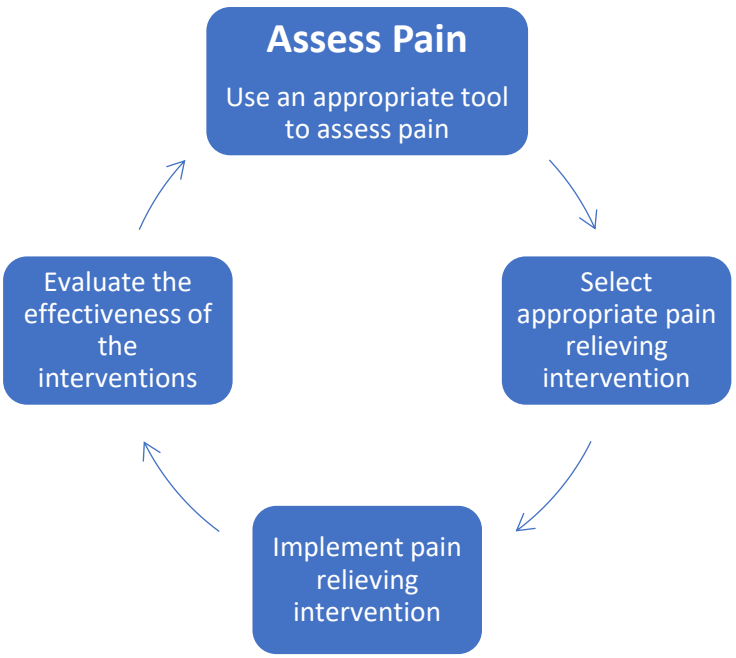


Figure 1 – The stages of pain management

Analgesic ladder

If a person scores their pain severity as **moderate or severe using any Pain tool** it is crucial that action is taken to relieve this pain.

This action could involve:

- Administration of prescribed analgesia (Table 1)
- Repositioning
- Distraction

Mild (0-3)	Moderate (4-6)	Severe (7-10)
Regular paracetamol +/- NSAID +/- Adjuvant	Regular paracetamol +/- NSAID Weak opioid (e.g. Codeine or Tramadol) +/- PRN immediate release strong opioid +/- Adjuvant	Regular paracetamol +/- NSAID Strong opioid (e.g. Morphine) or interventional pain management (e.g. Epidural or other appropriate central or regional technique) +/- Adjuvant

Table 1 – Analgesic ladder

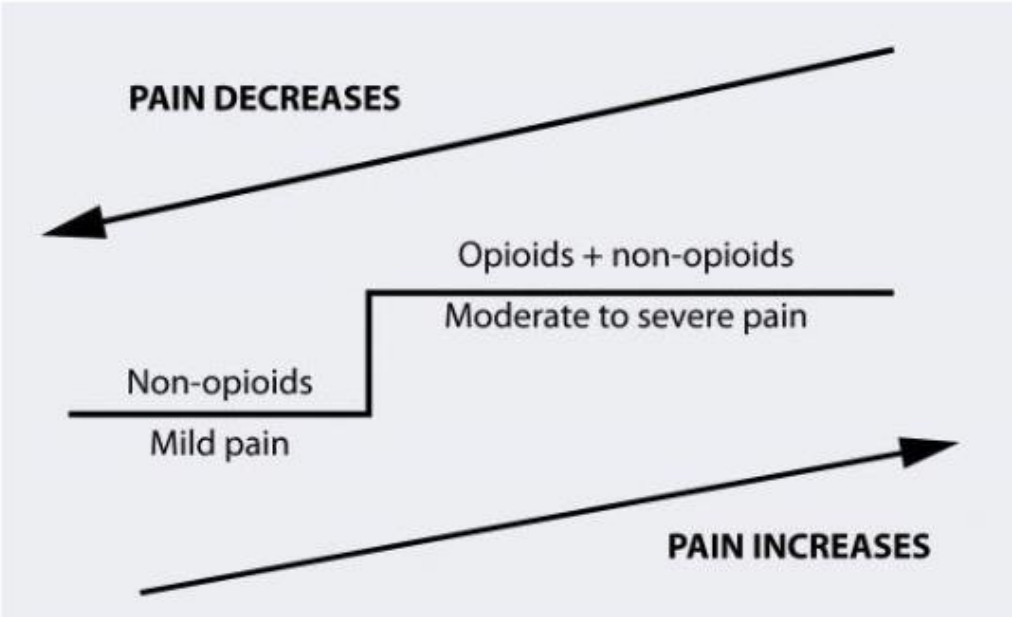


Figure 2 – Principles of pain management (Adapted from the WHO analgesic ladder)

Also, refer to the All-Wales Pharmacological Management of Pain Guidance. In making the best choices in relation to medicines for pain and adherence to general principles of good practice in the pharmacological management of pain. All Wales Pharmacological Management of Pain Guidance (nhs.wales)

Weaning opioids

It is possible to become dependent on strong opioids, therefore as a patient's pain improves, it is important that the dose of opioid analgesics is reduced, with a view to stopping them as soon as possible. Short term opioid therapy may lead to long term opioid use and misuse. Risk factors for prolonged postoperative use include preoperative opioid use, type of surgery, slow-release opioids, psychological and social factors and pre-existing alcohol or substance misuse disorder.

Before prescribing opioids, consideration needs to be given to possible opioid adverse effects including the potential risks of long-term opioid use, drug diversion, misuse, or abuse. Between 2 and 10% of patients continue to use opioid medication for months or even years following its postoperative initiation. Risk factors have also included medical comorbidities such as diabetes, heart failure and chronic lung disease, behavioural and social factors mental health comorbidities including depression, anxiety, and psychosis. Opioid prescribing limits for acute pain should be limited to a prescription of 7 days. Prescribing discharging medications should be done in considerations of opioid requirements on the day before discharge usually 5 days, avoiding slow-release opioids and for a limited duration. The hospital discharge letter must explicitly state the recommended opioid dose and duration. Patient education about risks of opioids and safe disposal of unused medication by return to a pharmacy and follow up by GP in case of ongoing issues improve safety of discharge medications.

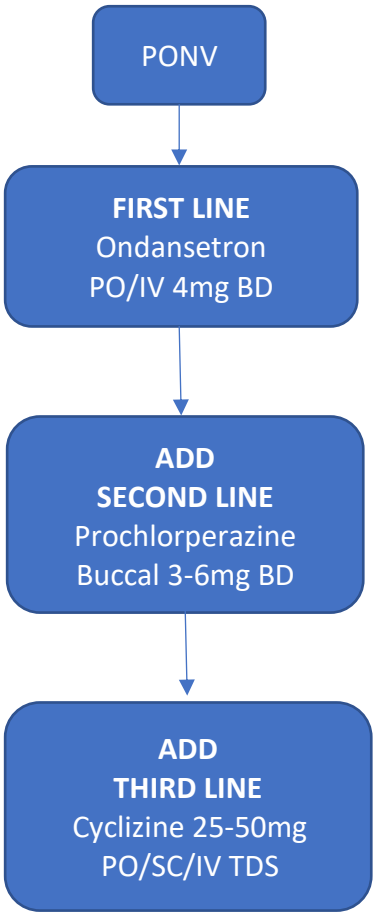
For further information on weaning opioids please refer to:
https://fpm.ac.uk/opioids-aware/information-patients

Anti-emetics

Post-operative nausea and vomiting (PONV) is a common and unpleasant complication of surgery and anaesthesia. It can be defined as nausea or vomiting within 48hrs of surgery and affects around 30% of patients. It can negatively impact nutrition, hydration and electrolyte balance and consequently increase length of hospital stay.

Ondansetron is the first line anti-emetic for adult patients and is effective in procedures associated with a high risk of PONV. The oral route of administration is as effective as the intravenous route in preventing PONV, however once PONV is established, IV administration is necessary.

Treatment of Post-operative nausea and vomiting (PONV) in the Recovery or ward setting



Allow 30 minutes to pass prior to assessing efficacy of treatment. The route of administration should be appropriate for the patient's condition e.g. PO/SC/IV/IM. If unresolved consult the patient's clinical team for assessment.
For further information on post-operative nausea and vomiting please refer to anaesthetic guideline: CAV Anaesthetic Guidelines.pdf

Naloxone

All patients who are prescribed strong opioids should have naloxone prescribed on the PRN side of the drug chart. It is used for the complete/partial reversal of opioids and has a short duration of action.

Repeated doses or infusion may therefore be necessary to reverse respiratory depression / sedation and the dose should be titrated to enable the patient's respiratory rate to reach 12/min. Naloxone should always be prescribed on the "PRN" side of the In-Patient Medication Administration Record Chart (included on pre-printed adhesive labels). This should be administered if the respiratory rate falls below 8/min. This is prescribed as 200 micrograms, but usually administered in 50 microgram increments, (Dilute a 1ml ampoule of naloxone 400mcg with 3mls of normal saline for injection to make a total of 4mls. Give in 50mcg (0.5ml) increments until respiratory rate > 12/min).

An IV infusion may be indicated when:

- previous bolus doses of naloxone have been given and symptoms of respiratory depression and sedation have recurred.
- the opioid taken has a long half-life
- or it is suspected that a large quantity of opioid has been taken.

REFER TO THE NARCAN INFUSION- AS PER EMERGENCY UNIT PROTOCOL FOR GUIDANCE.

See:
https://nhswales365.sharepoint.com/sites/CAV_Emergency%20Unit/SitePages/Clinical-Guidance.aspx - **In the folder Poisoning and Toxicology**

References

- ABMU (2016). A Guideline for Managing Adult Post-Operative Nausea and Vomiting (PONV) on the Surgical Wards. *Document No: CID532b*

- Cade, C. (2008). Clinical tools for the assessment of pain in sedated critically ill adults. *Nursing in Critical Care*. 13 (6) 288-297.

- McIntyre, P.E. et al. (2015) *Acute Pain Management: Scientific evidence*. 4th edition ANZAC and FPM

- Monroe, T. and Mion, L. (2012) Patients with advanced dementia: how do we know if they are in pain? *Geriatric Nursing* 33(3), p. 226-228

- Mosele, M. et al. (2012) Psychometric properties of the pain assessment in advanced dementia scale compared to self-assessment of pain in elderly patients. *Dementia and Geriatric Cognitive Disorders* 34(1), p. 38-43

- National Institute for Health and Care Excellence (NICE) (2021) *Analgesia – mild-to-moderate pain.* [Online]. Available at: https://cks.nice.org.uk/analgesia-mild-to-moderate-pain

- Paulson, C. et al. (2014) Pain Assessment in Hospitalized Older Adults with Dementia and Delirium. *Journal of Gerontological Nursing* 40(6), p. 10-15

- Pierre S, Whelan R. (2013) Nausea and Vomiting after Surgery. Continuing Education in Anaesthesia *Critical Care & Pain*; 13:28–32

- Warden, V. et al. (2003) Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale. *Journal of the American Medical Directors Association* 4(1), p. 9-15

- World Health Organization (WHO) (2018) *WHO guidelines for the pharmacological and radiotherapeutic management of cancer pain in adults and adolescents.* [Online]. Available at: WHO Guidelines for the pharmacological and radiotherapeutic management of cancer pain in adults and adolescents

- Wysong, P.R. (2014) Nurses' beliefs and Self-Reported Practices Related to Pain Assessment in Nonverbal Patients. *Pain Management Nursing* 15(1), p. 176-185

Section 3 – PATIENT CONTROLLED ANALGESIA (PCA)

Definition

Patient Controlled Analgesia (PCA) refers to the self-administration of pain relief and in this instance to the self-administration of intravenous opioids for the relief of acute pain in adults. Using a specific device, the patient is able to administer a predetermined dose of strong opioid at predetermined intervals, allowing for a wide variation in analgesic requirements

Indications

• The management of acute pain in patients likely to require strong opioid analgesia for at least 24-48 hrs (for example post-operative pain, post major trauma pain, sickle cell crisis).

• The management of moderate to severe acute pain in patients who are unable to tolerate oral medication.

Patient Controlled Analgesia should not be offered to:

- Patients who are incapable of using the device (physically or cognitively).
- Patients who appear reluctant to use the device.
- Patients with a head injury.
- Patients with an upper airway obstruction.
- Patients with sensitivity/allergy to opioids.

Patients should always receive information regarding the use of PCA, ideally prior to the PCA being set-up. They should receive both written (**APPENDIX 2**) and verbal information to enable maximum benefit of its use. Information should include:

• Simple explanation regarding how PCA works, including the use of the PCA demand button and the incorporated safety mechanisms e.g. lockout period, dosages etc.

• Realistic expectations that the PCA will substantially reduce pain but may not completely eradicate it.

• Reinforcement of the positive aspects of PCA, e.g. no injections.

• The importance of relatives/visitors not pressing the demand button i.e. that it must be **patient** controlled to ensure safety.

Prescription

In addition to the patient's own In-Patient Medication Administration Record, a Supplementary PCA prescription chart should be completed by the prescriber and be available for the nurse to check against the pump settings. Only those competent in the delivery of PCA analgesia should prescribe

this method of analgesia. Pre-printed adhesive labels are available to aid this process. Balanced analgesia – Regular paracetamol and if appropriate an NSAID should also be prescribed (Refer to Section 2 in these guidelines for further information).

Morphine and fentanyl are the standard opioids prescribed for PCA. Fentanyl to be used in patients with renal impairment. There are specific morphine and fentanyl supplementary PCA prescription charts that should be used (**APPENDIX 3**) and specific protocols programmed within the infusion device. Please ensure the correct PCA protocol is selected.

(A regimen for ketamine infusion is available. This must be discussed with and prescribed by an Anaesthetist. Please see ketamine Section 7 and (**APPENDIX 12**) for further prescribing guidance).

There may be circumstances when regularly prescribed opioids will be administered alongside PCA, e.g. in patients with chronic pain, patients who are under the care of the palliative care team, in patients who are opioid tolerant or whom are undergoing major surgery such as oesophagectomy. These patients should be discussed with the Acute Pain Service prior to commencement to ensure clinical risk is managed effectively.

The nurse looking after the patient should check that naloxone and an anti-emetic have also been prescribed to combat the potential side effects associated with strong opioids. A pre-printed label with these should be attached to the In-Patient Medication Administration Record.

Cardiac Intensive Care only prescription

Cardiac Intensive Care has 2 specific Fentanyl protocols and prescriptions (**APPENDIX 4**). The first prescription is used immediately postoperatively. It is a nurse-controlled analgesia (NCA), Fentanyl 25mcg/ml prescription with a continuous background infusion, for patients < 80 years and weight > 50kg, or for those patients > 80 years and weight < 50kg.

The second prescription is patient-controlled analgesia (PCA) Fentanyl 25mcg/ml and is used when the patient is deemed capable of using the PCA demand button.

Please ensure the correct supplementary PCA prescription, sticker and protocol are used. This prescription and protocol should only be used on Cardiac Intensive Care (CITU).

Equipment

• A dedicated PCA infusion device must be used.

• A dedicated PCA giving set incorporating an anti- reflux valve and an anti-syphon valve must always be used with these infusion devices.

• Infusion sets should be changed in accordance with the latest guidance from the manufacturer/ UHB.

• Anaesthetic and nursing staff must have received training and assessment in the use of these devices and achieved the relevant competencies as per C&V UHB policy. The Acute Pain Service and the Clinical Engineering Department will provide this training.

Designated clinical areas & responsibilities

Adult patients utilising PCA must be cared for in the following areas:

- Adult Surgical Wards /Post Anaesthetic Care Unit (PACU)
- Cardiothoracic Ward
- Adult Critical Care / Cardiac ITU / Recovery Unit
- Trauma, Orthopaedic & Spinal Wards
- B4 Haematology
- Polytrauma Unit (PTU)
- SDEC

With a PCA it is important to establish an initial plasma level of morphine. This can be achieved with small incremental opioid boluses in theatre +/- recovery unit until the patient is comfortable.

Respiratory Depression

Naloxone should always be prescribed on the "PRN" side of the In-Patient Medication Administration Record (included on pre-printed adhesive labels). This should be administered if the respiratory rate falls below 8/min. This is prescribed as 200 micrograms, but usually administered in 50 microgram increments, (Dilute a 1ml ampoule of naloxone 400mcg with 3mls of normal saline for injection to make a total of 4mls. Give in 50mcg (0.5ml) increments until respiratory rate > 12/min).

Naloxone can also be given for opioid induced pruritus (itching), dose of 50mcg. Please administer to patients experiencing distressing pruritus and change the prescribed opioid (unless the pruritis is associated with long-acting spinal opioid).

Monitoring

Careful monitoring of a patient receiving PCA is essential to ensure its safety. Following PCA initiation, observations of pulse rate, blood pressure, sedation level, respiration rate and pain severity should be recorded at ½- hourly intervals for 2 hours, then at 1 hourly intervals for 2 hours, 2 hourly intervals for 48 hours and 4 hourly intervals thereafter (if the observations have been stable). The respiratory rate should be counted for a full minute.

Nursing staff should ensure that controlled drugs are checked in accordance with the most recent C&V UHB guidance and ensure that syringes are correctly labelled according to the In-Patient Medication Administration Record. The PCA syringe should be checked hourly **by the qualified nurse caring for the patient** and the In-Patient Record of Administration Chart (Page 2 on the Supplementary PCA prescription chart) should be completed according to the most recent C&V UHB Infusion Policy. Information recorded should include:

- The volume remaining in the syringe.
- The number of delivered demands / refused demands.

When changing the syringe and at shift handover, 2 qualified nurses (**including the qualified nurse caring for the patient**) should check the protocol settings on the PCA infusion device, i.e. the bolus dose and lockout time, against the Supplementary PCA prescription chart. Any discrepancies should be reported to the APS, or if unavailable, the On-call Anaesthetist (Bleep 5101). Additionally, the PCA demand button should be removed from the patient immediately and the device be suspended (this will stop any continuous infusion in progress Cardiac ITU only), do **NOT** restart the device until the problem is resolved.

Inadequate analgesia

- Administer additional prescribed analgesia, such as paracetamol and/or NSAID.
- Encourage the patient to press the PCA demand button more frequently, ensuring they understand the concept of PCA.
- Reposition the patient.
- Contact the Acute Pain Service if there is no reduction in the patient's pain severity.

In the unusual circumstance where a patient may require a background infusion in addition to the bolus-only facility via the PCA, the patient should be cared for in a critical care area.

Discontinuing PCA

The decision to cease PCA should only be considered when the patient is able to tolerate / absorb analgesia via another route or when it is no longer deemed suitable for the patient. Please ensure that alternative analgesia is prescribed prior to stopping the PCA and that any unused analgesia, along with the syringe is disposed of in accordance with the C&V UHB infusion policy. The Acute Pain Service will not routinely review patients receiving just PCA. The decision to discontinue PCA can be made by the patient's team.

Complications / side-effects

- Respiratory depression
- Excessive sedation
- Nausea and vomiting
- Itching

The PCA care plan should be followed, and the appropriate action taken (**APPENDIX 3**)

References and Bibliography

- Halilotlu M, Eti Z, Gogus FY. (2010) The effects of epidural PCA, intravenous PCA and conventional opioid administration on postoperative pulmonary functions and analgesia after laparotomy. *Regional Anesthesia & Pain Medicine*;35: E93.

- Hudcova J, McNicol E, Quah C, Lau J, Carr DB. (2006) Patient controlled opioid analgesia versus conventional opioid analgesia for postoperative pain. Cochrane Database Syst Rev. 18;(4)

- Macintyre PE, SA Schug – (2021) Acute pain management -A practical guide

- Momeni M, Crucitti M, De Kock M. (2006) Patient-controlled analgesia in the management of postoperative pain. *Drugs*.66, (18):2321-37.

- Motamed C (2022) Update on Patient Controlled Analgesia for Acute postoperative pain. *Pharmacy*, 10 22

- Schultz, H. (2019) Patient-controlled oral analgesia at acute abdominal pain: A before and after intervention study of pain management during hospital stay. *Applied nursing research* vol 46.

Section 4 – EPIDURAL ANALGESIA

Definition

A low concentration of local anaesthetic with or without an opioid infused into the epidural space to provide pain relief, without loss of motor function.

Indications

Epidural analgesia provides excellent pain relief with high patient satisfaction when compared with other methods of analgesia. Epidural analgesia can be highly effective in controlling acute pain after surgery or trauma to the chest, abdomen, pelvis or lower limbs.

Contraindications

Absolute	Relative
• Patient refusal • Infection at site of catheter insertion • Raised intracranial pressure in those at risk of cerebral or cerebellar herniation • Allergy to agents prescribed in epidural analgesia • Lack of appropriate trained nursing/medical personnel available • Coagulopathy APTT ratio or INR >1.4 • Platelet count <100 • Local sepsis • Low molecular weight heparin e.g. Enoxaparin/Clexane given within 12 hours if on prophylactic dose (20-40mg) or within last 24hrs if on therapeutic dose (>40mg). A longer interval may be required in renal impairment. • Clopidogrel given within last 7 days • See AAGBI guidance in relation to other anticoagulation including DOACs AAGBI anticoagulation and regional anaesthesia • Inability to position patient for siting of epidural catheter	• Cognitive or communication impairment that leads to difficulty in clinical assessment of epidural function or complications. • The immunocompromised patient • **Patients with an abnormality of coagulation** • Sepsis with raised temperature and inflammatory markers

Prescription

Epidural analgesia should be prescribed as either a continuous infusion or as Patient Controlled Epidural Analgesia (PCEA). In addition to the patient's own In-Patient Medication Administration Record, the prescriber should also complete the Supplementary epidural prescription chart. Pre-printed labels are available in the anaesthetic rooms and the recovery rooms for use by the prescriber.

The following pre-filled bags of epidural analgesia solution are available for use:

- Fentanyl 2 micrograms/ml with Levobupivacaine 1mg/ml (0.1%)
- Levobupivacaine 1.25mg/ml (0.125%)

No other systemic opioids (strong/weak) should be prescribed whilst the patient is receiving epidural analgesia containing fentanyl. However, there may be exceptions to this rule e.g., patients with chronic pain, patients who are under the care of the palliative care team, patients who are opioid tolerant or patients undergoing oesophagectomy. Some patients may receive a local anaesthetic only epidural with a concurrent prescription of opioids via an alternative route. To ensure that clinical risk is managed effectively, these individual cases must be discussed with the Acute Pain Service so that adequate provision is made to review the patient.

The lowest effective infusion rate of local anaesthetic should be used to preserve motor function. This improves patient satisfaction, aids early mobilisation and aids detection of neurological complications.

Naloxone and ondansetron should be co-prescribed to combat the potential side effects associated with the use of opioid drugs.

Designated clinical areas and responsibilities

Adult patients receiving epidural analgesia can return to the following wards **ONLY:**

- Acute Surgical Wards & PACU,
- Adult Critical Care Areas / Cardiac ITU / Recovery Unit,
- Cardiothoracic Ward,
- Acute Polytrauma Unit (PTU) & Trauma Ward UHW.
- CAVOC- Elective Orthopaedic Ward UHL

Minimising the risk of wrong route error

The bags of epidural solution should be clearly labelled **'For Epidural Use Only'.** No bags of epidural analgesia solution should be stored in the operating theatres or anaesthetic rooms.

Epidural infusion bags containing Fentanyl and Bupivacaine should be stored in a lockable controlled drug cupboard. Local anaesthetic ONLY infusion bags should be stored in a separate cupboard from those holding intravenous and other types of infusion bags in order to reduce risk of wrong route administration

Epidural infusions should be connected to the epidural catheter as soon as possible by the clinician responsible for its insertion, to minimise errors due to wrong route administration of local anaesthetic.

Adverse events suspected to be associated with epidural infusions should always be reported via the MHRA Yellow Card Scheme.

Equipment

The epidural infusion device and dedicated yellow giving set must be used and labelled correctly. It must be easily distinguishable from those used for intravenous and other routes. A bacterial filter must always be used.

A patent intravenous cannula must be in situ for the duration the patient is receiving epidural analgesia.

Please refer to NRFit lead for latest guidance on the transition of use of the newly developed NRFit neuraxial connector. For further information please refer to local guidance.

Initiating treatment & monitoring

Epidural catheters should ideally be inserted in the Anaesthetic room. It may sometimes be necessary to perform this technique in Critical Care. (A urinary catheter should also routinely be inserted except in orthopaedic patients where this decision will be made at the discretion of the team).

Nurses' responsibilities

Setup of the Infusion device should only occur in the Recovery Unit by a recovery nurse, an advanced pump device user and/or the Acute Pain Service. All of whom has been assessed as competent in the setup of the device.

- The infusion device will be setup on Protocol A, B, or D (according to prescription) and primed using the dedicated yellow infusion line and a prefilled bag of solution.

- The protocol and infusion device settings will be checked and signed for with another suitably trained registered nurse using the In-Patient Medication Administration Record and Supplementary Epidural Prescription Chart.

- Once all checks have been completed, the infusion device and yellow giving set will be attached to the epidural catheters via the bacterial filter using aseptic non- touch technique (ANTT).

- All connections are checked as being tight and secure.

- A "NOT FOR IV CONNECTION" sticker will be attached to the yellow infusion line at the point where it joins the bacterial filter.

- The patient must have patent IV access.

- Registered nurses with specific training and skills in the supervision of epidural analgesia and management of its complications should be present on the ward and on every shift.

Monitoring

In the immediate postoperative period, if the patient is complaining of moderate to severe pain; the epidural analgesia is running at its maximum rate and the patient has received all available prescribed analgesia, nursing staff in the Recovery room should contact the appropriate Anaesthetist or member of the Acute Pain Service as a bolus of epidural analgesia solution or local anaesthetic might be necessary to settle the patient before they return to the ward area.

In the Recovery room patients should also be monitored for complications until the responsible clinician is satisfied that safe discharge to the ward may occur. Patients should not be discharged to a ward if it is unable to deliver appropriate monitoring and care of a patient receiving epidural analgesia.

- Patients receiving epidural analgesia should be monitored by suitably trained qualified nurses.

- On return to the ward area observation and documentation of pulse rate, blood pressure, respiration rate and oxygen saturation levels should be initiated at **½ hourly** intervals for **2 hours** and completed **2 hourly** thereafter.

- Sedation is often the first indication of opioid toxicity, hence sedation score should be recorded and documented **2 hourly** and action taken if this score is 2 or 3.

- Additional requirements for monitoring may be determined by the nature of the surgery, the age of the patient and any clinical conditions they have.

- Care should be taken of a patient nursed in a head down position for prolonged periods, as there is a risk of cephalad spread of epidural solution, with the potential risk of subsequent complications.

- Assess and document pain scores (at rest and on movement or deep breathing) and nausea scores 2 hourly. If the patient reports moderate or severe pain, increase the rate of the epidural infusion within the prescribed rates and administer other available analgesia.

- Temperature should be recorded **4 hourly** to aid detection of infection.

- The epidural catheter insertion site should be covered with an IV 3000 dressing and the insertion site be monitored and documented **6 hourly** for inflammation, pus, tenderness leakage bleeding, bruising, or swelling. Findings should be documented in the nursing documentation.

- **Note: If the epidural catheter insertion site displays any signs of infection, the site is exposed or the filter becomes disconnected, the epidural catheter should be removed. If infection of the epidural site is suspected once the epidural catheter is removed send swab and catheter**

tip to Microbiology and the surgical team, inserting Anaesthetist and the Acute Pain Service (APS) should be notified. If no concerns about severe or deep infection, consider flucloxacillin or doxycycline if penicillin allergy or suspected/high risk for MRSA. If known MRSA colonised- please review sensitivities and call microbiology if needed. In pregnancy, alternative to doxycycline in penicillin allergy would be clindamycin. If there are any concerns about severe or deeper infection (i.e. epidural space collection) contact Microbiology for tailored treatment and management plan. For antibiotic doses see BNF.

- If the patient reports moderate to severe pain that is not being controlled with maximum rate epidural and balanced analgesia, top-up bolus injections may be required. These should **ONLY** be administered by the APS or an Anaesthetist after careful assessment. (**APPENDIX 5**).

- Following an epidural bolus more intensive monitoring of the patient is required as there may be a subsequent drop in blood pressure. A minimum period of every 5 minutes for the first 30 minutes should be maintained.

- The patient should also be asked to 'straight leg raise'(SLR) bilaterally **2 hourly** to monitor for possible development of motor block (potentially caused by excessive local anaesthetic administration or more seriously, epidural haematoma/abscess). This monitoring should be documented **2 hourly** whilst the patient is receiving epidural analgesia and for a further **24 hours** following epidural catheter removal. The Bromage scale (**APPENDIX 6**) should be used to assess ability to straight leg raise.

- Please refer to and follow the leg weakness flow chart (**APPENDIX 7**) if any leg weakness is identified.

- If a dense motor block fails to resolve after 2 hours following cessation of the epidural analgesia infusion or if the motor block increases, an escalation in care is necessary i.e., the Acute Pain Service and/or on-call Anaesthetist should be called to assess the patient urgently.

- New onset of severe back pain in a patient who has recently received epidural injection +/- infusion should raise suspicion of epidural abscess or haematoma. **Inform the On-call Anaesthetist as a matter of urgency.**

- Staff should be made aware that increased or breakthrough pain in an otherwise working epidural might indicate that the epidural catheter has moved or more seriously, that there is a surgical complication, for example the development of compartment syndrome. These patients should be urgently reviewed by an Anaesthetist. Special care should be taken when interpreting physical signs in patients who may have sustained neurological damage.

- Document **1 hourly** infusion device checks as per C&V UHB infusion device policy.

- During every staff change, the epidural infusion device must have its protocol checked against the prescription on the Supplementary Prescription Chart and Inpatient Medication administration Record (**APPENDIX 8**). These checks must be signed on the record of administration chart by both registered nurses.

- Change the premixed infusion bags as required, indicating on the record of administration chart that a new bag has been commenced. **TWO** registered nurses must sign for the new bag on the In-Patient Medication Administration Record.

- Ensure that the epidural catheter always remains connected to the infusion device and is never disconnected from the bacterial filter. This will reduce the risk of wrong route error. ***If there has been an inadvertent wrong route error stop the infusion immediately and follow the AAGBI QRH June 2023 including LA toxicity guidelines*** *and see (**APPENDIX 10**).*

Anticoagulation and epidural analgesia

Dose, timings and therapeutic effect of all anti-coagulants should be considered when:

- Inserting an epidural catheter
- Removing an epidural catheter
- Instituting anticoagulation whilst an epidural catheter is in situ

The concurrent use of anti-coagulation with epidural analgesia increases the risk of epidural haematoma, that if left untreated may cause spinal cord compression and in turn lead to paralysis. Further advice may need to be sought from a haematologist if the patient has a coagulopathy/ deranged coagulation or a co-morbidity that would adversely affect coagulation (such as renal function)

Following insertion of epidural catheter – Low Molecular Weight Heparin (LMWH) e.g., Enoxaparin, dalteparin, tinzaparin should not be administered for 4 hours.

If the patient is receiving a heparin infusion, contact APS/On-call Anaesthetist for advice. There needs to be close liaison between Surgical team and APS to optimise the patient's treatment

The use of direct oral anticoagulants (DOACs) e.g., rivaroxaban, apixaban, edoxaban and dabigatran is not recommended and should NOT be given whilst an epidural catheter is still in place.

Whilst an epidural catheter is in situ, anticoagulation is best managed with prophylactic low molecular weight heparin.

If a DOAC is inadvertently given whilst an epidural catheter is in situ, follow guidance under section: (Discontinuing epidural analgesia), regarding the time intervals required for safe removal of the epidural catheter and for the administration of the next drug dose of the DOAC.

Oral anticoagulant treatments e.g., **Warfarin / Antiplatelets e.g., Clopidogrel, Prasugrel or Ticagrelor, Dipyridamole, Cilostazol: should NOT be administered whilst a patient is receiving epidural analgesia**

If the patient is newly prescribed any of these treatments following a cardiovascular event whilst receiving epidural analgesia, contact the APS / On-call Consultant Anaesthetist urgently for advice BEFORE giving the new treatment (the epidural catheter will need to be removed prior to commencing the new anticoagulant and alternative analgesia will need prescribing).

If a patient is prescribed any anti-platelet / oral anticoagulant drug not indicated above, please contact APS for advice.

Please refer to care plan for further information on anticoagulation and epidural analgesia (**APPENDIX 8**).

Potential side-effects / complications associated with epidural analgesia

Complications	Recommendation
Hypotension	Hypotension should be recognised and treated promptly. A fall in blood pressure greater than 20% from baseline warrants further assessment and management. Assessment of hypotension should include the exclusion of causes other than sympathetic blockade. Management may require the use of a fluid bolus and vasoactive drugs
Spinal Canal Space Occupying Lesions (Including epidural haematoma and epidural abscess)	Nursing staff should be trained to recognise signs and symptoms of spinal canal space occupying lesions in patients receiving epidural analgesia. Epidural abscess should be considered in all patients with signs of (otherwise unexplained) systemic infection with an epidural in situ or with infection at the epidural site. Note: not all patients with epidural abscess display fever. The presence of severe or increasing back pain, even in the absence of fever may indicate epidural infection and should be reported to the responsible Anaesthetist/ On-call Anaesthetist and APS immediately. Other symptoms that should raise concern include inappropriate motor weakness (even when unilateral). Epidural catheter removal is identified as the time of greatest risk for epidural haematoma development. Local guidelines on the timing of safe catheter removal should be followed when patients are receiving anti-coagulant medication. Clinical suspicion of a spinal canal space occupying lesion should prompt urgent discussion with a senior Anaesthetist. Epidural haematoma and abscess are considered neurosurgical emergencies.

	Clinical suspicion of an epidural vertebral canal haematoma or abscess should be investigated firstly with an urgent MRI scan (unless contraindicated) by the team responsible for managing the epidural. If this pathology is identified, there must be urgent discussion with the local neurosurgical unit to determine further management.
Total Spinal	Total spinal is an anaesthetic emergency that should be considered in any case of respiratory arrest, cardiovascular collapse or loss of consciousness in a patient who has recently received an epidural bolus. The Resuscitation Team (ext 2222) should be called and treatment in the first instance is stopping the epidural infusion and supportive measures in accordance with paediatric life support guidelines. This includes securing the airway, ensuring adequate ventilation and supporting the cardiovascular system with fluids and/or vasoactive medications.
Post-Dural Puncture Headache (PDPH)	Any patient developing a headache following epidural anaesthesia/analgesia or with a known accidental dural puncture should be followed up until headache resolution. Differential diagnoses should be considered for all patients. Those patients not responding to conservative treatment should be offered epidural blood patch, if appropriate. Those with unresolved symptoms should be discussed with a neurologist and undergo further investigations to exclude complications of PDPH or an alternative diagnosis.
Local Anaesthetic Toxicity (LAT)	The Association of Anaesthetists have published concise guidelines regarding the management of severe local anaesthetic toxicity. These should be readily available in all areas where boluses are administered via epidurals along with an emergency treatment box including 20% lipid emulsion (i.e. Intralipid®).
Neuropraxia and Major Nerve Damage	In the rare event of any form of nerve injury occurring after epidural insertion (but not related to a spinal canal space occupying lesion) urgent referral to a neurologist should be made and should be reported using locally established patient incident reporting systems.

Discontinuing epidural analgesia

- Epidural analgesia infusions for management of acute pain should be maintained for up to 5 days. The risk of infection rises beyond this point.

- Consideration should be given to the severity of the patient's pain and if they are able to tolerate alternative analgesia via other routes of administration.

- Regular balanced and PRN analgesia should be commenced on stopping epidural analgesia. This should avoid inadequate pain management when transitioning to alternative pain management.

- Epidural infusions do not have to be weaned prior to discontinuing.

- Once stopped, the epidural catheter and infusion device should be left in place for 4 hours and pain assessment continued (in-case epidural analgesia needs to be recommenced).

- If pain severity scores escalate and the patient's pain is not managed by alternative analgesia, the epidural analgesia can restart (if not exceeding 5 days) and an attempt can be made to stop it once again after a further 24 hours. In exceptional circumstances it may be necessary to administer epidural analgesia for more than 5 days. This should be managed on an individual patient basis and advice be sought from the Acute Pain Service, inserting Anaesthetist or On-call Anaesthetist.

- All patients receiving epidural analgesia should have blood samples taken for FBC, COAG and APTT ratio on the day that the epidural catheter is to be removed. The epidural catheter should only be removed if the platelet count is greater than 100, APTT ratio is 1.4 or less and PT is <24. However, if there is a high risk of epidural related infection, specific advice should be sought from the on-call Consultant Anaesthetist/Acute Pain Service.

- **At least 12 hours** should elapse between the last prophylactic dose of Low Molecular Weight Heparin (LMWH) (e.g., enoxaparin 20mg or 40mgs) or a prophylactic dose of tinzaparin or dalterparin and the removal of the epidural catheter.

- If the patient is receiving a therapeutic dose of LMWH (e.g., enoxaparin >40mg daily) or a therapeutic dose of tinzaparin or dalterparin, **then 24 hours should elapse** between the last dose given and the time that the epidural catheter is removed.

- The next dose of LMWH (e.g., enoxaparin, tinzaparin or dalterparin should not be administered **for at least 4 hours** following the removal of the epidural catheter.

- If a direct oral anticoagulant (DOAC) is inadvertently given whilst an epidural catheter is in situ i.e., rivaroxaban, apixaban or edoxaban, **at least 24 hours** should elapse between its

administration and the removal of the epidural catheter - **Contact APS or On-call Anaesthetist for advice.**

- The next dose of rivaroxaban, apixaban or edoxaban should not be administered for at **least 6 hours** following the removal of the epidural catheter.

- If the DOAC dabigatran is inadvertently given whilst the epidural catheter is in situ, a minimum of at least 48 hours (renal function dependent) should elapse between its administration and removal of the epidural catheter - **Contact APS or On-call Anaesthetist for advice.**

- The next dose of dabigatran should not be administered for at **least 6 hours** following the removal of the epidural catheter.

- If the patient is receiving or has been started on any anti-platelet / oral anti-coagulant medication not mentioned above, please contact APS or On-call Anaesthetist for advice.

- If the patient has a coagulopathy or is receiving an intravenous heparin infusion, seek advice from the APS/on-call Anaesthetist (**APPENDIX 9**)**.**

- Consideration may be given to the removal of the urinary catheter once the epidural catheter has been removed, or if a decision has been made to definitely not restart epidural analgesia.

- Epidural catheters can only be removed by trained staff using an Aseptic Non-Touch Technique (**ANTT)**. Carefully remove the dressing and with gentle traction remove the catheter. Apply a non-occlusive dressing for at least 24 hours. If there is any resistance, do not continue and inform the Acute Pain Service or on-call Obstetric Anaesthetist out of hours. Ensure the full length of the catheter is removed, that the end of the catheter (blue tip) is visualised and document in notes. If there are any signs of infection at the catheter site, send the tip and swab from the insertion site for MC&S and inform the Acute Pain Service.

- The epidural insertion site should continue to be observed and findings documented, for 3 days following the removal of the epidural catheter (for any signs of infection). 2 hourly assessments of the patient's ability to straight leg raise should also continue to be documented for 24 hours post epidural catheter removal. The APS or On-call Anaesthetist should be contacted regarding any concerns.

- If the patient is discharged before this time is up, or if the patient experiences any new back pain, altered sensation/weakness to lower limbs or unexpected bowel or bladder problems, the patient should contact the APS or Obstetric Anaesthetist on duty via the hospital switch board. A patient information leaflet regarding epidural analgesia and containing this advice will be provided by the APS to all patients receiving epidural analgesia.

- It is the responsibility of the discharging nurse to ensure that the district nurse conducts epidural site checks as outlined above. Written and verbal advice should be provided to the patient, alerting them to the signs and symptoms of an epidural abscess and what to do if these occur after discharge home.

Local anaesthetic toxicity can occur if there is excessive absorption into the bloodstream. It is rare but imperative that the signs are recognised and that it is managed according to the AAGBI Guidelines. Hourly monitoring aims to identify symptoms in the earliest stages to ensure remedial action can be taken.

Management of severe local anaesthetic toxicity

Early signs of local anaesthetic toxicity	Action for early signs
• Tingling around the mouth • Tinnitus • Light headiness • Muscle twitching • Visual disturbance	• Stop regional continuous local anaesthetic • Continue monitoring as per guideline and increase frequency as dictated by clinical presentation. • Continue close monitoring until symptoms subside • Recommencing the epidural infusion of local anaesthetic should only occur following discussion with an Anaesthetist and Acute Pain Service. • If continuous regional local anaesthetic is to be recommenced, consider restarting at a lower rate.
Critical signs of local anaesthetic toxicity	Action
• Unresponsiveness • Fitting • Cardiac arrest	• Follow and refer to ***AAGBI QRH June 2023 including LA toxicity guidelines*** and see (**APPENDIX 10**) • Simultaneously call the arrest team and commence basic life support • Stop regional continuous infusion of local anaesthetist
NB: Intralipid is located in the main recovery rooms at UHW and UHL and SSSU recovery room at University Hospital of Wales	

References and Bibliography

- Barby, K.D. (2021) Care of critically ill patients with epidural pain management, *Journal of PeriAnesthesia Nursing,*36: 428-430.

- Faculty of Pain Medicine of The Royal College of Anaesthetists (2020) Best Practice in the Management of Epidural Analgesia in the Hospital Setting.fpm.ac.uk/sites/fpm/files/documents/2020-09/Epidural-AUG-2020-FINAL.pdf (Last accessed:25th August 2020) Epidural-AUG-2020-FINAL.pdf (fpm.ac.uk)

- Galligan, M. (2020) Care and management of patients receiving epidural analgesia, *Nursing Standard,* 35, 77-82.

- McLaren, S. et al. (2020) A guide to epidural management, *British Journal of Hospital Medicine*, 81 (1), 1-7.

- Rawal, N. (2021) Epidural analgesia for postoperative pain: Improving outcomes or adding risks? *British Practice and Research Clinical Anaesthesiology*, 35: 53-65.

- Sawhney, M. (2018) Removing epidural catheters: A guide for nurses, *Nursing,* 48 (12), 47-49 removing_epidural_catheters__a_guide_for_nurses.15.pdf

Section 5 - MANAGEMENT OF ACUTE PAIN IN ADULTS USING REGIONAL CONTINOUS INFUSIONS OF LOCAL ANAESTHETIC (See Section 4 for epidural analgesia)

Definition

A continuous infusion of local anaesthetic into an area of the body, regional analgesia can be used as part of a multi modal approach for acute pain management in adults. Regional continuous infusions of local anaesthetic can reduce the patient's requirement for opioids and their subsequent potential side effects. This in turn can improve the patient's experience and recovery. Local anaesthetics exert their analgesic effect by blocking sodium channels and impeding neuronal excitation and conduction.

Indications

The management of acute postoperative pain and pain following trauma.

Contraindications

Absolute	Caution
Patient refusal Local infection/sepsis Allergy to local anaesthetic drugs (suspected or documented)	Hepatic impairment Coagulopathy

Regional analgesia should be prescribed as a continuous infusion. In addition to the patient's own In-Patient Medication Administration Record, the prescriber should complete a Supplementary Regional Continuous Prescription chart. Pre-printed labels are available in the anaesthetic rooms and recovery rooms for use by the prescriber to affix to the PRN side of the medication chart.

The following pre-filled regional continuous analgesia solutions are available for use:

- Levobupivacaine 1.25mg/ml (0.125%)

Regular and PRN balanced analgesia should be prescribed alongside the regional continuous infusion of local anaesthetic.

Equipment

A dedicated pain management infusion device along with a dedicated yellow infusion line that is correctly labelled must be used. A bacterial filter must always be used, and the patient must always have a patent intravenous cannula whilst receiving regional local anaesthetic infusion.

Designated areas of responsibility

Patients with a regional local anaesthetic continuous infusion must be cared for in the following areas:

- Acute Surgical Wards & PACU,
- Adult Critical Care Areas / Cardiac ITU / Recovery Unit,
- Cardiothoracic Ward,
- Acute Polytrauma Unit (PTU) &Trauma ward UHW
- Cavoc -Elective Orthopaedic Ward UHL

Initiating treatment and monitoring of patients receiving regional continuous analgesia

Nurses' responsibilities:

All registered nurses caring for a patient with regional continuous infusion of local anaesthetic must have received specific training in the management of such. Setup of the infusion device should only occur in the Recovery Unit by a recovery nurse, an advanced device user and / or a member of the Acute Pain Service. All of whom must have been assessed as competent in the setup of the device.

• The infusion device will be setup on Protocol H or J (according to prescription) and primed using the dedicated yellow infusion line and a prefilled bag of levobupivacaine 1.25mg/ml (0.125%) will be set up.

• The protocol and infusion device settings will be checked with another suitably trained registered nurse and the record of administration chart signed by both.

• Once all checks have been completed, the infusion device will be attached to the regional catheters via the bacterial filter(s) using ANTT.

• All connections must be checked as being tight and secure.

• A "NOT FOR I.V. CONNECTION" sticker will be attached to the yellow infusion line at the point where it joins the bacterial filter.

• The patient must have patent I.V. access.

• The infusion can be initiated at the prescribed rate.

• Monitor and document ½ hourly observations for the first 2 hours after the infusion has been initiated and 2 hourly thereafter if stable, until the infusion is discontinued. More frequent observations are required if clinically indicated.

• Assess and document pain scores (at rest, on movement and deep breathing), sedation scores and nausea scores 2 hourly. If the patient reports moderate or severe pain, increase the rate of the local anaesthetic infusion within the prescribed limits and if necessary, administer PRN analgesia.

• Assess the regional local infusion catheter insertion site(s) for bleeding, bruising, swelling, redness and leaking 6 hourly and document findings in the nursing notes. Note any evidence of infection of the regional local anaesthetic site and remove where there are concerns of infection. Once catheter removed send swab and catheter tip to Microbiology. If no concerns about deep or severe infection, consider flucloxacillin or doxycycline if penicillin allergy or suspected/ high risk for MRSA. If known MRSA colonised, please review sensitivities and call microbiology if needed. In pregnancy, the alternative to doxycycline in penicillin allergy would be clindamycin. If there are concerns about a severe or deeper infection, contact Microbiology for tailored treatment and management plan. For antibiotic doses- see BNF

• Document 1 hourly infusion device checks as per C&V UHB infusion device policy.

• During every staff change the infusion device must have its protocol, medication chart and device settings checked. These checks must be signed on the Record of Administration chart by both registered nurses.

• Change the premixed levobupivacaine infusion bags as required, indicating on the record of administration chart that a new bag has commenced. TWO registered nurses must sign for the new bag on the prescription chart.

• Ensure that the regional continuous infusion of local anaesthetic remains connected to the infusion device at all times and is never disconnected from the bacterial filter. This will reduce the risk of wrong route error. If there has been an inadvertent wrong route error stop the infusion immediately and follow the and refer to ***AAGBI QRH June 2023 including LA toxicity guidelines*** and see (**APPENDIX 10**)

• Please refer to the regional analgesia care plan (**APPENDIX 8**) for further trouble shooting guidance.

Minimising wrong route error

The bags of local anaesthetic infusion solution should be clearly labelled and should be stored in the Recovery Unit. Bags of local anaesthetic solution should be stored in a separate cupboard from those holding intravenous and other types of infusion in order to reduce risk of wrong route administration.

Discontinuing infusion

• Discontinuing regional local anaesthetic infusions should only occur on the advice of the Acute Pain Service and / or Obstetrics on-call Anaesthetist.

• Regional continuous infusions of local anaesthetic for management of acute pain can be maintained for up to 5 days.

• Regular and rescue analgesia should continue / commence prior to stopping the continuous regional anaesthetic infusion in order to avoid inadequate pain management when transitioning to alternative pain management.

• Regional continuous infusions of local anaesthetic do not have to be weaned prior to discontinuing.

• Once stopped the regional continuous infusions of local anaesthetic catheter and infusion device should be left in place for 4 hours and pain assessment continue.

• If pain is not managed by alternative analgesia, the regional continuous infusion of local anaesthetic can be restarted (if not exceeding 5 days) and re-assessed after a further 24 hours. This should first be discussed with Acute Pain Service or the Obstetrics on-call Anaesthetist.

• Infusion catheters can only be removed by trained staff using ANTT. Carefully remove the dressing and with gentle traction, remove the catheter(s). Apply a non-occlusive dressing for at least 24 hours. If there is resistance, do not continue - inform the surgical team and Acute Pain Service. On occasions it has been necessary for patients to have stubborn catheters surgically removed. Ensure the full length of the catheter is removed, i.e. that the end of the catheter is visualised and this is documented in the nursing notes. If there are any signs of infection at the catheter insertion site, send the tip and swab of the insertion site for M, C & S. Please also inform the Acute Pain Service.

Management of severe local anaesthetic toxicity

Local anaesthetic toxicity can occur if there is excessive absorption into the bloodstream. It is rare but imperative that the signs are recognised and that the patient is managed according to the AAGBI QRH June 2023 which include LA toxicity guidelines and refer to **APPENDIX 10**). Hourly monitoring aims to identify symptoms in the earliest stages to ensure immediate action can be taken.

Early signs of local anaesthetic toxicity	**Action for early signs**
Tingling around the mouth Tinnitus Light headiness Muscle twitching Visual disturbance	Stop regional continuous local anaesthetic Continue monitoring as per guideline and increase frequency as dictated by clinical presentation Continue close monitoring until symptoms subside All symptoms should be reported and discussed with Acute Pain Service and or Obstetric on-call Anaesthetist. Recommencing the regional infusion of local anaesthetic should only occur following discussion with an Anaesthetist and Acute Pain Service and all symptoms are subsided. If continuous regional local anaesthetic is to be recommenced, consider restarting at a lower rate. Maintain oxygenation and BP throughout
Critical signs of local anaesthetic toxicity	**Action for critical signs**
Unresponsiveness Convulsions Cardiovascular collapse: bradycardia, arrhythmias & / or cardiac arrest.	Follow ***AAGBI QRH June 2023 including LA toxicity guidelines*** and see (**APPENDIX 10**) Simultaneously call the arrest team and commence basic life support Stop regional continuous infusion of local anaesthetic.
NB: Intralipid is located in the main Recovery room at UHL and main Recovery room of UHW	

References and Bibliography

- Bhatnagar, S., Mishra, S., Madhurima, S., Gurjar, M. & Mondal, A.S. (2006) Clonidine as an analgesic adjuvant to continuous paravertebral bupivacaine for post thoracotomy pain. Anaesthetic Intensive Care, 34: 586-91

- Capdevila, X., Biboulet, P., & Morau, D. et al. (2002) Continuous three-in-one block for postoperative pain after lower limb orthopaedic surgery: where do the catheters go? *Anaesthetic Analgesia*, 94: 1001-6.

- Comish, P. & Deacon, A. (2007) Rectus sheath catheters for continuous analgesia after upper abdominal surgery. *ANZ Journal of Surgery*, 77:84.

- National Patient Safety Agency (2011) Patient Safety Alert 21; Safer practice with epidural injections and infusions

Section 6- INTRATHECAL OPIOID ANALGESIA

Definition:

Intrathecal opioids can provide safe and effective analgesia for 12-24 hours postoperatively.

Indications:

Intrathecal opioids can provide post-operative analgesia for thoracic, abdominal, lower limb and spinal surgery.

Contraindications / Cautions:

- Allergy to morphine / diamorphine.
- Patients on CNS depressants / high dose opioids.
- Advanced respiratory disease / obstructive sleep apnoea / high BMI

Prescription:

The dose of intrathecal opioid given will depend on the patient's age, weight and the procedure being undertaken. The dose will be at the discretion of the anaesthetist.

The recommended doses are:

- Morphine 100 - 750mcg
- Diamorphine 500mcg - 1mg

The anaesthetist must place a **pre-printed intrathecal opioid** sticker on the In-Patient Medication Administration Record to indicate that the patient has received intrathecal opioid.

NSAIDs such as Ibuprofen and Paracetamol should be prescribed as regular medications if not contraindicated.

As per pre-printed intrathecal opioid sticker, PRN morphine can be given as rescue analgesia, either as an oral or subcutaneous dose (not both):

- 2.5-10mg orally 1 hourly
- 2.5-5mg subcutaneous injection 1 hourly

A patient can also be prescribed morphine / fentanyl PCA instead of prn morphine given orally or via subcutaneous injection if the anaesthetist feels that PRN morphine will not be sufficient or if the patient is NBM. The anaesthetist must place the pre-printed labels for both the intrathecal opioid and PCA in the Patient Medication Administration record chart.

Designated clinical areas & responsibilities

Adult patients who have received intrathecal opioids should be cared for in the following areas:

- Adult Surgical Wards /Post Anaesthetic Care Unit (PACU)
- Cardiothoracic Ward
- Adult Critical Care / Cardiac ITU / Recovery Unit
- Trauma, Orthopaedic Wards UHW & UHL
- Polytrauma Unit (PTU)
- SDEC

Monitoring of patients:

Observation of pulse rate, blood pressure, pain severity, nausea and vomiting score, sedation score, temperature and respiratory rate should be documented ½ hourly for the first two hours, then 2 hourly thereafter for the first 24 hours.

Patients must have a patent intravenous cannula in situ for 24 hours following the administration of intrathecal opioid analgesia.

See the intrathecal analgesia care plan (**APPENDIX 11**) for further information on monitoring and the management of potential side effects.

Thromboprophylaxis:

Following the administration of intrathecal opioids, there should be at least a 6-hour gap, before administering rivaroxaban, apixaban, edoxaban or dabigatran.

There should be a 4-hour gap from the administration of intrathecal opioid to the next dose of low molecular weight heparin (enoxaparin), or if prescribed tinzaparin or daltaparin.

References and Bibliography

- Hutchins JL, Renfro L, Orza F, Honl C, Navare S, Berg AA. (2019) The addition of intrathecal morphine to a transversus abdominis plane block with liposome bupivacaine provides more effective analgesia than transversus abdominis plane block with liposome bupivacaine alone: a retrospective study. *Local Reg Anesth*. 12:7-13.

- Koning. Mark, Teunissen AJW, Van der Harst E, Ruijgrok EJ, Stolker RJ. (2018) Intrathecal morphine for laparoscopic segmental colonic resection as part of enhanced recovery protocol. A randomized controlled trial. *American society of regional anaesthesia and pain medicine*. 43(2):166-173

Section 7- KETAMINE INTRAVENOUS INFUSION

Definition

Ketamine is an intravenous anaesthetic which if used in sub-anaesthetic doses has an analgesic action both centrally and peripherally in the nervous system. Ketamine exerts strong adjuvant analgesic properties by inhibiting the binding of glutamate to the NMDA receptor. This mode of action is different to the action of opioids such as morphine and therefore the use of ketamine in combination with opioids can improve pain relief.

NB Esketamine has previously been used in C&VUHB for Acute Pain Management. This is no longer readily available in the UK. **Esketamine is twice as potent as Ketamine** and therefore dose adjustments need to occur when prescribing Ketamine
i.e. Ketamine 10mg in 1ml is equivalent to Esketamine 5mg in 1ml

Only Ketamine should be prescribed in the management of acute pain management in CAVUHB.

Indications

Management of acute postoperative / severe pain as part of a multi-modal approach frequently where strong opioids are insufficient in managing pain. Ketamine delivered as a continuous infusion alongside a strong opioid will have an opiate sparing effect thus minimising opioid related side effects.

Its use is indicated in the following cases:

- Severe ischaemic pain
- Postoperative amputation
- Opioid tolerant patients
- Pain that is not opioid responsive
- Neuropathic pain
- Post scoliosis surgery

Contraindications

Absolute	Cautions
➢ Hypertension ➢ Severe cardiac disease ➢ Raised intracranial pressure ➢ Head trauma	➢ Renal failure ➢ Liver failure ➢ Predisposition to hallucinations or nightmares ➢ Pregnancy

Absolute	**Cautions**
➢ Pre-eclampsia	➢ Alcoholism ➢ Confirmed or suspected drug abuse ➢ Glaucoma ➢ Major psychiatric illness e.g. schizophrenia and acute psychosis ➢ Acute intermittent porphyria ➢ Epilepsy ➢ Hyperthyroidism or patients receiving thyroid replacement (increased risk of hypertension and tachycardia) ➢ Current respiratory infection (ketamine sensitises the gag reflex, potentially causing laryngospasm)

Prescription

Ketamine must be prescribed by an anaesthetist or intensivist using the pre-printed label and affixed on the 'as required' side of the medication chart. The adult intravenous ketamine infusion prescription (**APPENDIX 12**) must also be signed and added to the patient's notes.
The ketamine infusion will be used as an adjuvant to opioids. Paracetamol, strong or weak opioids, non-steroidal anti-inflammatory drugs, (if appropriate and not contraindicated) plus local anaesthetics can be used concurrently. As ketamine has an opioid sparing effect, the opioid dose may need to be reduced to avoid over sedation or respiratory depression. The ketamine infusion should not exceed 5 days.

Equipment

- A dedicated PCA infusion device must be used.
- A dedicated PCA giving set incorporating an anti- reflux valve and an anti-syphon valve must always be used with these infusion devices.
- Infusion sets should be changed according to local policy.

• Nursing staff must have received training and assessment in the use of these PCA infusion devices and achieved the relevant competencies. The Clinical Engineering Department and the Acute Pain Service will provide this training.

Designated clinical areas

• Adult Surgical wards (NOT assessment areas)
• Adult Critical Care & PACU
• Adult Trauma and Spinal wards

Initiating treatment and monitoring

All registered nurses caring for an adult with an intravenous ketamine infusion must have received specific training in the management of such infusions. Setup of the infusion should only occur in the Recovery Unit by a recovery nurse, an advanced infusion device user and / or the Acute Pain Service. All of whom must have been assessed as competent.

• The infusion device will be setup on the appropriate intravenous ketamine infusion protocol.
• The protocol, infusion device settings, and prescription, will be checked alongside patient identification, with another suitably trained registered nurse and the record of administration chart signed by both.
• Once all checks have been completed, the infusion device will be attached to the patient's patent I.V. cannula and the infusion will be initiated at the prescribed rate.

Potential side effects

• Hallucinations / Changes in sensory perception
• Increased confusion.
• Hypertension

Please refer to the attached care plan for all monitoring requirements for patients receiving intravenous ketamine infusion (**APPENDIX 12**).

Discontinuing the Ketamine infusion

The decision to cease the ketamine infusion should be made in consultation with the Acute Pain Service / Anaesthetist. Ketamine must be disposed of in accordance with the C&V UHB infusion policy.

References

- Bell RF (1999) Low dose subcutaneous Ketamine infusion and morphine tolerance. *Pain* 83: 101-103.

- Brian M. Radvansky, Khushbu Shah, Anant Parikh, Anthony N. Sifonios, Vanny Le, Jean D. Eloy, (2015) "Role of Ketamine in Acute Postoperative Pain Management: A Narrative Review", *BioMed Research International*, vol. Article ID 749837.

- Brinck EC, Tiippana E, Heesen M, Bell RF, Straube S, Moore RA, Kontinen V. (2018) Perioperative intravenous ketamine for acute postoperative pain in adults. *Cochrane Database Syst Rev*. 20;12(12).

- Chandrakantan. A & Glass. P. S. A (2011) Multimodal therapies for PONV and pain. BJA107(S1): i27-i40.

- Craven R. (2007) Ketamine. *Anaesthesia.* 62, Supplement 1: 48-53

- Hocking G and Cousins MJ (2003) Ketamine in Chronic Pain Management: An Evidence-Based Review. *Anesth Analg*, 97: 1730-1739.

- Hoking G, Visser EJV, Schug SA and Cousins MJ (2007) Ketamine; Does life Begin at 40? Pain, 15 (3); 1-6 (accessed online on 22 April 2008).

- How to use the evidence: assessment and application of scientific evidence. AusInfo, Canberra, Australia. Neil MJE (2008) Survey on the use of Ketamine infusions in Scottish Hospitals*. The British Pain Society Pain News*, Summer: 36-37

- Ricciardelli RM, Walters NM, Pomerantz M, Metcalfe B, Afroze F, Ehlers M, Leduc L, Feustel P, Silverman E, Carl A. (2020) The efficacy of ketamine for postoperative pain control in adolescent patients undergoing spinal fusion surgery for idiopathic scoliosis*. Spine Deform*. Jun;8(3):433-440.

- Subramaniam K, Subramaniam B and Steinbrook RA (2004) Ketamine as Adjuvant Analgesic to Opioids': A Quantitative and Qualitative Systematic Review. *Anesth Analg*, 99: 482-495.

Section 8- INTRAVENOUS LIDOCAINE FOR MANAGEMENT OF ACUTE PAIN IN ADULT PATIENTS

Definition

Lidocaine is a membrane stabilising agent and sodium channel blocker. It is used as a local anaesthetic, a cardiac anti-arrhythmic, and analgesic agent. It is a potent anti-inflammatory, antihyperalgesic and has pro peristaltic effects. As an analgesic, lidocaine is given for the relief of acute and chronic neuropathic pain. It can be administered I.V. as a bolus and/or continuous infusion. In some situations, lidocaine infusions may be used in chronic pain management and / or in palliative care. This will be under the direction of specialists in these areas and are not included in this protocol.

Indications

Intravenous lidocaine infusions can be used as part of a balanced analgesia regimen in conjunction with other analgesics including paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs), intravenous and intrathecal opioids, magnesium sulphate, ketamine, and α2-agonists. It is increasingly used in enhanced recovery protocols. It has particular benefit where hyperalgesia occurs or where opioid therapy has not been effective. Evidence for its use is summarised in the table below:

Type of surgery	Results	Evidence
Open abdominal	Decreased pain scores, opioid consumption, PONV, duration of ileus, and length of stay	Strong: benefit shown in multiple studies or meta-analyses
Laparoscopic abdominal (colectomy, cholecystectomy, gastrectomy)	Decreased pain scores, opioid consumption, and duration of ileus	Strong: benefit shown in multiple studies or meta-analyses
Open prostate	Decreased pain scores, opioid consumption, duration of ileus, and length of stay	Moderate: small benefit, limited number of studies
Breast	Decreased incidence of chronic pain at 3 and 6 months No effect on pain scores, opioid consumption, or PONV	Moderate: small benefit, limited number of studies
Thoracic	Decreased pain scores and opioid consumption	Moderate: small benefit in one study
Ambulatory	Decreased pain in recovery, faster discharge	Moderate: small benefit, limited number of studies
Multilevel spine	Decreased pain scores, improved quality of life 1 and 3 months post-op	Moderate: small benefit in one study

Contraindications

Absolute:	Relative:	Patient factors that predispose toxicity:
▪ Patient explicitly declines consent ▪ Local anaesthetic allergy ▪ Concurrent use of other regional techniques involving boluses / large doses of other local anaesthetics ▪ Pt weighs < 40kg ▪ Hypovolaemia	▪ Patient unable to consent ▪ Heart block ▪ Heart failure ▪ Seizure disorders ▪ Renal impairment (eGFR <30mL/min/1.73m2) ▪ Hepatic impairment ▪ Pregnancy / breastfeeding ▪ Hypokalaemia (antagonises the effect of Lidocaine) ▪ Myasthenia Gravis ▪ Porphyria	▪ Heart failure ▪ Hepatic impairment ▪ Renal impairment ▪ Acidaemia ▪ Hypoalbuminaemia ▪ Specific medications: o Beta blockers o Amiodarone

Drug interactions

Lidocaine interacts with:

- Anti-retrovirals – plasma concentration of lidocaine possibly increased
- Cimetidine – plasma concentration lidocaine increased
- Suxamethonium – neuromuscular blockade enhanced and prolonged
- Anti-arrhythmics – increased myocardial depression
- Antipsychotics – increased risk of ventricular arrhythmias
- Beta-blockers – increased myocardial depression and risk of lidocaine toxicity
- Diuretics and acetazolamide – hypokalaemia resulting from these agents may antagonise the effect of lidocaine.

Please refer to current British National Formulary for full list of drug interactions.

Administration of alternative local anaesthetics

Intravenous lidocaine should not be used at the same time as, or within the period of action of other local anaesthetic interventions. The following recommendations should be adhered to:

- Intravenous lidocaine should not be started within 4hr of any nerve or fascial plane block, or infiltration of laparoscopic port sites.
- No nerve or fascial plane blocks should be performed until 4hr after completion of an I.V. lidocaine infusion.
- Boluses of local anaesthetic must not be given into wound catheters or epidural catheters until 4hr after completion of an I.V. lidocaine infusion.
- Infusions (without boluses) through wound or epidural catheters may be started 30 min after an infusion of I.V. lidocaine has been stopped.
- Topical 5% lidocaine medicated plasters should be removed before starting an I.V. lidocaine infusion.

- Single-shot spinal blockade does not pose a problem given the small dose of local anaesthetic used; intrathecal opioids can therefore be used in conjunction with I.V. lidocaine.

Equipment

Always:	
Reliable I.V. access – dedicated to I.V. lidocaine exclusively Lidocaine 1% without adrenaline – **only 1% concentration is ever to be used** Known location of intralipid – readily available. AAGBI LA toxicity protocol present	
Bolus:	**Infusion:**
10 ml syringe Resuscitation equipment and drugs NIBP, pulse oximeter, 3 lead ECG	50 ml syringe + dedicated PCA line Dedicated appropriate infusion device to deliver Lidocaine Infusion NIBP, pulse oximeter, 3 lead ECG Anti-siphon and anti-reflux device in line A fluid line with one-way anti reflux valve attached to lidocaine infusion running with 0.9% sodium chloride at a minimum of 10mls/hr Lidocaine monitoring chart Available on unit (not needed at bedside): Resuscitation equipment and drugs

Procedure

Intravenous Lidocaine should only be started by, or on the advice of, Consultant Anaesthetist or Consultant Intensivist experienced in the use of intravenous lidocaine infusions in the post-operative period.

Prior to treatment:

Weigh the patient. If BMI > 30 use ideal body weight (IBW) as follows:

Height (cm) - 105 = IBW for women in kg

Height (cm) - 100 = IBW for men in kg Where BMI

Where BMI<30 use ABW (actual body weight)

INITIAL I.V. BOLUS DOSES OF LIDOCAINE
To Be Administered By Anaesthetist Only

Administration:

Lidocaine 1% (10mg/ml) **1.5 mg/kg** given by slow I.V. injection over **10 minutes**

Max Bolus Dose to be administered = **120mg** (**12mls**).

CONTINUOUS I.V. INFUSION OF LIDOCAINE:

Administration:

Anaesthetist will initiate infusion at rate of **0.25-1.5 mg/kg/hr of Lidocaine 1% (10mg/ml)**
(e.g. for 70kg patient 1.75 – 10.5 mls/hr of neat Lidocaine 1%)

Max Continuous Rate to be administered = **120mg/hr** (**12mls/hr**).

Infusions can be continued post-operatively for up to **24 hours**.

The only clinical areas in UHW that can accept patients receiving lidocaine infusions are:

- Recovery ward
- Post anaesthetic care unit (PACU)
- Critical care clinical area

If continuing into post-operative period infusion can be adjusted (by staff trained and assessed in the use of infusion device) by 0.25-0.5 mg/kg/hr to a maximum of 1.5 mg/kg/hr based on clinical response or signs of toxicity.

Infusions must be discontinued prior to discharge to any other ward or at 24 hours (whichever occurs first).

At discontinuation of Lidocaine Infusion, the Lidocaine giving set should be disconnected from the dedicated I.V. cannula and the cannula be flushed with 0.9% N/Saline. The giving set should be immediately disposed of according to C&VUHB guidance.

TO BE USED IN OPERATING THEATRES, RECOVERY OR CRITICAL CARE ONLY
PATIENTS MUST NOT BE RETURNED TO ANY OTHER CLINICAL AREA*

Monitoring of patients

Intra-operative period: As per AAGBI Recommendations for standards of monitoring during anaesthesia and recovery (2015) Can reduce anaesthetic requirements by up to one third - consider depth of anaesthesia monitoring

Post-operative period:
Continuous ECG and oxygen saturations

Additionally, a full vital observation (including NIBP, sedation, nausea & vomiting and pain scores) plus assessment for local anaesthetic toxicity should be performed:

- every 15 min for the first hour
- then hourly as a minimum thereafter (increased as necessary depending on patient condition).

As with all drug infusions, the infusion, the pump and the patient must be checked hourly, and the dedicated Lidocaine Infusion Chart completed (**APPENDIX 13**).

Assessment for any LA toxicity should be documented on Lidocaine Infusion Chart. Nurses should use specific questioning to identify LA toxicity as part of their observations.

The half-life of Lidocaine is 1-1.5 hours. Once the Lidocaine Infusion is stopped, any side effects should dissipate within this time frame. However, the analgesic effect may last longer than the pharmacological half-life. Hourly monitoring should therefore continue for 4hrs after the Lidocaine Infusion has been discontinued.

If concerns over LA toxicity or if there is an adverse incident:

- The pump should be retained and returned to Pump Library for its history to be downloaded.
- Blood samples should be taken: EDTA tube and Lithium heparin tube

Management of complications and side effects

LOCAL ANAESTHETIC TOXICITY

Observe for signs and symptoms of local anaesthetic toxicity:

- peri-oral numbness
- metallic taste
- tinnitus
- dizziness
- confusion
- agitation
- blurred vision
- double vision
- visual hallucinations
- twitching
- tremors
- seizures
- bradycardia
- hypotension
- hypertension (may be an early sign)
- sedation
- respiratory depression

STOP the infusion if there are any signs or symptoms of local anaesthetic toxicity and inform Senior Anaesthetist / Acute Pain Service.

Most symptoms will usually disappear with cessation of the infusion for 1-2 hours. Resumption of infusion at a decreased rate should only occur following discussion with an Anaesthetist or the Acute Pain Service.

In the event of severe symptoms of toxicity, for example hypotension, bradycardia, severe somnolence, or confusion, infusion must be stopped immediately, and senior anaesthetist notified. Severe local anaesthetic toxicity should be managed as per AAGBI Safety Guideline - Management of Severe Local Anaesthetic Toxicity (2010). (**APPENDIX 10**)

NB. Intralipid is located in recovery ward areas in both University Hospital of Wales and University Hospital Llandough.

Documentation

Pre-operative period

Consent, including brief summary of what discussed and rationale for use.

Intra-operative period

Document dose administered on anaesthetic chart

Post-operative period

Ensure pre-printed prescription sticker is completed and signed on PRN side of the medication chart and on the Supplementary Lidocaine infusion chart.

Document patient assessments as per monitoring section.

Complete the Supplementary Lidocaine infusion chart as per monitoring section.

Patient Education

Instruct the patient to notify staff if experiencing twitching, tremors, drowsiness, tinnitus, peri-oral numbness, metallic taste, dizziness, confusion, blurred or double vision, visual hallucinations, or deteriorating pain control. This should occur pre-operatively if possible or as soon as possible post-operatively. This information may need to be reinforced several times throughout the duration of infusion.

References

- Dunn LK, Durieux ME. (2017) Perioperative use of intravenous lidocaine. *Anaesthesiology*; 126(4): 729-737

- Eipe N, Gupta S, Penning J. (2016). Intravenous lidocaine for acute pain: an evidence-based clinical update. *BJA Education*; 16(9): 292-298

- Fool *et al*. (2020) The use of intravenous lidocaine for postoperative pain and recovery: international consensus statement on efficacy and safety. Anaesthesia. First published 03 November 2020 [https://doi.org/10.1111/anae.15270]

- Pandit JJ and McGuire N. (2020) Unlicensed intravenous lidocaine for postoperative pain: always a safer 'licence to stop' than to start. Anaesthesia. Editorial. First published 03 November 2020. [https://doi.org/10.1111/anae.15286]

Section 9-MANAGEMENT OF BLUNT CHEST TRAUMA / RIB FRACTURES

Definition

Blunt chest trauma refers to any injury of the chest wall or within the thoracic cavity arising from a blunt mechanism or force. Rib fractures are a frequent injury following blunt chest wall trauma. They may result from high-impact trauma such as that seen in road traffic accidents or falls from a height, penetrating trauma, contact sport injuries, severe coughing, pathology, secondary to radiotherapy and traumatic fractures can also occur due to cardiopulmonary resuscitation (CPR) (Williams et al 2020).

A rib fracture is a break in a bone making up the rib cage. Blunt chest wall trauma accounts for over 15% of trauma admissions to Emergency Departments worldwide (Battle et al 2014). 55% of patients with chest trauma will fracture a rib, with 10% suffering multiple rib fractures. Trauma affecting the chest wall, even in isolation, can carry significant morbidity and mortality. Older patients have twice the morbidity and mortality of younger patients; with every subsequent rib fractured, mortality increases by 19% and morbidity by 27% (Barry & Thompson 2018). Therefore, appropriate pain management is vital to avoid complications such as respiratory failure, pneumonia and prevent Critical Care admission. Management of this patient group is challenging due to the delayed onset of severe respiratory complications (48-72 hrs later).

Indications:

- For the assessment and management of pain in adult patients with blunt chest trauma/ rib fractures.
- To ensure that patients admitted with blunt chest trauma receive optimal treatment and adequate analgesia, that is started promptly and proactively on hospital admission or on referral.
- To ensure the pain relief is sufficient to enable movement, deep breathing, coughing, and clearance of any secretions, to keep the lungs fully inflated and reduce the risk of secondary respiratory and non-respiratory complications.
- Confirm accurate diagnosis, adequate analgesia and effective physiotherapy which are essential components in the management of rib fractures if complications are to be avoided.

Initial diagnosis / assessment

All patients admitted with suspected chest wall trauma should have a chest x-ray (CXR) as a minimum and patients requiring admission should go on to have a computed tomography (CT) thorax.

Rib fractures are poorly visualised on CXR, and CT scanning should be considered for all patients with suspected rib fractures. The **National Institute for Health and Care Excellence (2016)** advises early and liberal use of CT chest imaging in patients with suspected chest trauma, particularly in the presence of multiple comorbidities or anticoagulation.

Referral and initial management

On admission to the Emergency Unit (EU) all patients with rib fractures should be referred to the Acute Pain Service (APS), as should those who have sustained in hospital rib injury. (**Bleep 5414** Monday – Friday 8-8, Saturday 8-6, and Sunday 8-15.30) or duty On-call Obstetric Anaesthetist out of hours (**Bleep 5101**). This will enable escalation of analgesia and a pain management plan to be put in place.

A Risk Stratification using the Rib Fracture Scoring Tool should be completed. This will signpost to the appropriate analgesic intervention / level of care (see guidance below and (**APPENDIX 14**)**.**

Initial analgesia should be prescribed utilising the WHO analgesic ladder principles and this should be administered to enable the patient to take deep breaths, cough and move whilst awaiting review by the APS / On- call Obstetric Anaesthetist. In the first instance consider regular paracetamol +/- NSAIDs (if not contraindicated - caution in elderly), regular and PRN opioids and lidocaine 5% patches (700mgs) 12hrs on 12hrs off. Non-pharmacological methods should also be used, such as provision of a support cushion, heat/cold packs, repositioning, distraction, relaxation etc.

All patients admitted following chest wall injury should be referred to a Respiratory Physiotherapist within 24hrs of admission for early assessment and input.

Assessment with Rib Fracture Scoring Tool

Following appropriate initial patient assessment, management and imaging, a risk stratification using the Rib Fracture Scoring Tool, should be completed by the admitting team in the EU, APS or out of hours duty Obstetric Anaesthetist (**SEE APPENDIX 14**).

The prognostic tool as well as clinical presentation will alert and quantify the potential for deterioration; determine the type of intervention needed and inform referral decisions.

Patient age, number of rib fractures, presence of chronic lung disease, pre-injury anticoagulant use and deteriorating oxygen saturation levels have been identified as risk factors that may predict complications after blunt chest-wall trauma. The risk of developing complications increases with an increasing score.

The patient's risk score and clinical presentation will help direct patients to an appropriate area of care.

Patients with a Rib score greater than 20 are high priority for allocation to the Polytrauma Unit (PTU). Those with a score below 20, if appropriate, can be considered for a surgical, trauma bed or medical bed or may even be discharged home with suitable analgesia.

Patient access must be informed of patients requiring admission and their priority.

Referral to the Patient at Risk Team (PART) or Critical Care should be considered if the rib fracture score is greater than 30 or if the patient is presenting with a flail chest.

Designated clinical areas and responsibilities:

The EU is not currently permitted to manage PCAs or regional anaesthetic infusion devices. Those patients requiring PCA, or regional analgesia must be nursed on the Polytrauma Unit (PTU), an Acute Adult Surgical Ward or Spinal/Trauma ward, i.e. where there are appropriately trained staff to manage patients with these devices.

Pain assessment

Effective management of acute pain in the blunt chest trauma patient relies on accurate and appropriate assessment of the patient's pain.

Pain severity should be systematically recorded on movement, deep breathing, and coughing, using an appropriate Pain Assessment Tool (**see section 2 and APPENDIX 1**).

Patients need to be sufficiently comfortable to be able to take deep breaths, cough and comply with physiotherapy to reduce respiratory complications.

Prescription

Analgesic options

- Providing prompt and effective analgesia is fundamental to the management of patients with rib fractures. An individualised analgesic approach is recommended for each patient, depending on their rib score, pain score, injuries sustained, age and clinical presentation.
- Therefore, analgesic options range from balanced oral analgesia, patient-controlled analgesia (PCA), to regional anaesthetic techniques. Regional anaesthesia options include erector spinae plane block (ESP), epidural analgesia and serratus anterior block (SAP).

Regional anaesthesia should be considered:

- For patients with a low rib score, but whose pain is inadequately controlled with oral / topical /sub-cutaneous / intravenous analgesia.
- First line for patients with a Rib score >25.

RIB FRACTURE INJURY SCORE/ SUGGESTED ANALGESIA	
Rib score:	**Analgesic management:**
0-15	**Oral analgesia +/- topical adjuvants** • Regular paracetamol 1g QDS (dose adjust if < 50kgs, caution in liver disease). • Lidocaine plaster 5% (700mgs) 12hrs on / 12hrs off. Max 3 plasters to be applied within a 24-hour period. • Consider NSAID (unless contraindicated and caution in e.g. patients with haemothorax, the elderly, refer to analgesic recipe book for further cautions to NSAIDs) 400mg ibuprofen TDS with PPI cover, 30mg lansoprazole • Consider weak opioid (codeine or tramadol) QDS (unless contraindicated). Tramadol is contraindicated in patients with epilepsy. Caution with tramadol also in patients > 65yrs, may need lower dose, 25-50mg. • PRN short-acting strong oral opioid, morphine (oramorph) or oxycodone (shortec). If no contraindications. • If pain persists, consider PCA.
15-20	**Intravenous analgesia +/- topical adjuvants** • Regular paracetamol 1g QDS (dose adjust if < 50kgs, caution in liver disease) +/- NSAID (if no contraindications) • Lidocaine plaster 5% (700mg) 12hrs on / 12hrs off. Max x 3 plasters to be applied within a 24-hour period. • PRN short-acting strong opioid and consider PCA (if no contraindications) • Long-acting opioid, e.g. MST 5mg BD or longtec 5mg BD (if no contraindications). • If pain persists, consider regional analgesia.
21 +	**Regional analgesia** • List on MTC or CEPOD list for regional local anaesthetic (LA) block or thoracic epidural. • Continue all analgesia as above until regional analgesia in place, then stop lidocaine 5% plasters and if pain is well managed consider reducing opioids. • Patient may be considered by Cardiothoracics for rib fixation and may be referred for Critical Care assessment.

To combat potential side effects associated with opioids, ensure all patients are prescribed:

- Regular laxatives e.g. senna 15mg BD and laxido 1-2 sachets BD.
- PRN anti-emetic e.g. ondansetron 4mg TDS or cyclizine 50mgs
- PRN naloxone 400mcg given in 50mcg increments in case of opioid toxicity

Refer to the analgesic recipe book for management of patients with blunt chest trauma (**APPENDIX 15**)

Most patients with rib fractures can be managed with a combination of the measures outlined above, however, a small proportion may benefit from undergoing surgical fixation. Operative intervention has been shown to reduce the length of critical care admission, duration of ventilation and improve overall mortality in patients with three or more fractured ribs and flail chest. (McLaughlin, 2020).

Equipment and monitoring:

If patient is receiving oral opioid analgesia:

- Monitor and record blood pressure, pulse rate, respiratory rate (respirations should be counted for a full minute) oxygen saturation levels, sedation, and nausea scores 2 hourly, more frequently if the patient's condition dictates.

- Pain assessments should be completed at least 2 hourly and before and after each dose of opioid to assess its efficacy.

If the patient is utilising PCA:

- A dedicated PCA infusion device must be used.
- A dedicated PCA giving set incorporating an anti- reflux valve and anti-syphon valve must be used.
- Infusion sets should be changed in accordance with the latest guidance from the manufacturer/ UHB.
- The infusion device should be attached securely to a drip stand.
- See PCA guidelines in **SECTION 3** and PCA care plan (**APPENDIX 3**) regarding care, monitoring and management of any complications.

If the patient is receiving epidural or regional analgesia:

- A dedicated pain management infusion device must be used. A dedicated yellow infusion line must be used and labelled correctly. It must be easily distinguishable from those used for intravenous and other routes. A bacterial filter must always be used.
- A patent intravenous cannula **MUST** be in situ
- See epidural guidelines in **SECTION 4** and epidural care plan (**APPENDIX 8**) regarding care, monitoring and management of any complications.
- See regional analgesia guidelines in **SECTION 5** and regional analgesia care plan (**APPENDIX 8**) regarding the care, monitoring and management of any complications.

All anaesthetic and nursing staff must have received training and assessment in the use of these devices and achieved the relevant competencies as per C&V UHB policy. The APS and the Clinical Engineering Department will provide this training.

Pain management of the blunt chest trauma patient

Day 1-5 post admission

If the patient is finding that pain is preventing deep breathing, coughing or mobilising:

- Ensure that regular and PRN analgesics are prescribed on the In-Patient Medication Administration Record Chart and are being administered.
- Contact the APS / On-call Anaesthetist out of hours if current analgesic measures are ineffective.

If PCA is being used:

- Ensure the patient understands its concept and is using appropriately pre-emptively.
- Check that the IV cannula is patent
- Consider adding a regular weak or strong opioid, such as codeine, tramadol, MST or longtec to optimise baseline analgesia.
- Provide patient with an information leaflet to reinforce use of the PCA and understanding.

If regional analgesic infusion is being utilised:

- Increase the infusion rate within prescribed parameters.
- Increase the concentration of the local anaesthetic (within safe limits of 2mg/kg/4hrs).
- Consider adding a regular weak or strong opioid, such as codeine, tramadol, MST or longtec to optimise baseline analgesia.
- Provide patient with an information leaflet to reinforce understanding of regional analgesia.

If epidural analgesia is in use:

- Check that the epidural catheter is secured and has not migrated out of the space (cms at skin documented on the epidural prescription chart/Anaesthetic chart).
- Increase the infusion rate within prescribed parameters.
- Encourage the patient to utilise the PCEA demand function.
- Consider adding a regular weak or strong opioid if receiving a local anaesthetic only epidural, such as codeine, tramadol, MST or longtec as a baseline analgesic.
- If there is no improvement in the patient's pain, contact the APS / On-call Anaesthetist (out of hours) to administer an epidural clinician bolus.
- Provide patient with an information leaflet to reinforce understanding of epidural analgesia.

N.B epidural / regional analgesia infusions usually remain in situ for 5 days. Prior to discontinuing, ensure adequate alternative oral analgesia is prescribed. Do **NOT** wean epidural analgesia prior to stopping the infusion.

STEP DOWN ANALGESIA

If PCA is being used:

- Consider stopping PCA when the patient can eat and drink.
- Consider starting long-acting opioid 12 hours prior to stopping the PCA, if not already prescribed.
- Ensure adequate regular and PRN balanced analgesia is prescribed and encourage the patient to have this pre-emptively to facilitate mobilisation and physiotherapy.
- Ensure the patient is prescribed regular laxatives.

If regional / epidural analgesia is being utilised:

- The APS will write a plan in the patient's notes regarding discontinuation of the infusion - usually on Day 4 or 5 post insertion.
- Consider starting a long-acting opioid 12 hours prior to stopping the infusion, if not already prescribed.
- Ensure adequate regular and **PRN** balanced analgesia is prescribed and encourage the patient to have this pre-emptively to facilitate mobilisation and physio.
- Ensure the patient is prescribed regular laxatives.

If utilising oral analgesia:

- Consider reduction of opioids after day 7 (sooner if the pain is well controlled).
- If the patient is being transferred or discharged home on opioids, write a plan for opioid reduction that the patient's GP will be informed of. Long-acting opioids should ideally be stopped prior to discharge.
- Provide the patient with an information leaflet regarding opioid reduction.
- Ensure the patient is prescribed regular laxatives.
- Ensure lidocaine plaster prescriptions are reviewed every 72hrs and are discontinued after a maximum of 10 days.

Refer to the analgesic recipe book for management of patients with blunt chest trauma (APPENDIX 15)

References and Bibliography

- Barry, R. & Thompson, E. (2018) Outcomes after rib fractures in geriatric blunt trauma patients, *American Journal of Surgery,* 215 (16), 1020-3.

- Battle, C. et al. (2014) Predicting outcomes after blunt chest wall trauma: development and external validation of a new prognostic model, *Critical Care,* 18: 1-8. Predicting outcomes after blunt chest wall trauma: development and external validation of a new prognostic model (nih.gov)

- Hoepelman, R.J. et al. (2022) Rib fractures in the elderly population: a systematic review, *Archives of Orthopaedic and Trauma Surgery.* Rib fractures in the elderly population: a systematic review - PMC (nih.gov)

- Jeffery, Z. et al. (2019) Management of rib fractures, *British Journal of Hospital Medicine,* 80 (20), 146-149

- Lloyd, J. & Jackson, L. (2020) UHW Analgesia for Blunt Chest Trauma/Rib Fracture Standard Operating Procedure. 3rd ed. Cardiff and Vale University Health Board.

- May, L. et al. (2016) Rib fracture management, *British Journal of Anaesthesia*, 16 (1),26-32.

- McLauglin, D. (2020) Management of the treatment of rib fractures. [online] Available at: untitled (wfsahq.org)

- National Institute for Health Care Excellence (2016) Major Trauma: assessment and initial management. [Nice Guideline No. NG39]. Overview | Major trauma: assessment and initial management | Guidance | NICE

- Simon, J.B. et al. (2019) Blunt chest wall trauma: an overview, *British Journal of Hospital Medicine,* 80 (12), 711-715.

- Williams, A. et al. (2020) Anaesthetic and surgical management of rib fractures, *British Journal of Anaesthesia*, 20 (10), 332-340.

Section 10 - MANAGEMENT OF INDIVIDUALS IN SICKLE CELL CRISIS

Definition

Sickle cell anaemia is a chronic condition that can be life limiting and individuals with the condition often experience acute episodes of severe pain.

Indications

The severity of symptoms during sickle cell crisis can vary quite significantly, but pain is often one of the main reasons for hospital admission. It is important to manage the pain associated with sickle cell crisis to help with this unpleasant symptom and reduce complications.

All patients being admitted with sickle cell crisis should be referred to the Sickle cell CNS and Acute Pain Service.

Balanced analgesia

Patients who have previously been admitted to UHW with sickle cell crisis should have individual protocols for their pain management. Copies of these are kept on B4H, Emergency Unit, Assessment Unit, by the Sickle cell CNS and Acute Pain Service. They can also be found in individual patients' notes.

Balanced analgesia should be prescribed for all patients in sickle cell crisis. That is, Paracetamol and an NSAID (if not contraindicated) as a **regular** prescription. Contraindications to NSAIDs include known allergy, renal impairment, hypotension, history of gastric ulceration, aspirin sensitive asthma and marked dehydration. Use with **caution** in the elderly and in those patients with actual or potential coagulopathy. A regular weak opioid and PRN immediate release strong opioid should also be prescribed.

If the pain is unmanaged with this regimen, a long-acting strong opioid should be commenced regularly, for example MST or longtec in place of the regular weak opioid (See World Health Organisation analgesic ladder – (**APPENDIX 1**).

Not all patients in sickle cell crisis require **Patient Controlled Analgesia (PCA)** but those who do, must be managed using the guidelines set out in **Section 3**.

PCA infusion devices are kept in the Recovery room in theatres. A dedicated infusion set with an anti-syphon valve must be used. Morphine 50ml vials (2mg/ml) are available from Pharmacy. The PCA infusion device has pre-programmed protocols for the use of morphine, fentanyl, remifentanil (for use on obstetrics only) and ketamine (continuous infusion only). A 'general' protocol is available for other drugs that may be used within the hospital. A paediatric protocol is also available (see separate paediatric guidelines). When the PCA infusion device is no longer required, staff should clean it and leave it in the agreed area for collection by equipment library staff.

Designated clinical areas & responsibilities

Patients admitted with sickle cell crisis and requiring PCA should be nursed on B4 Haematology

Initiating treatment & monitoring of patient using PCA

Patients admitted with sickle cell crisis, requiring PCA, should be referred to the Acute Pain Service or the On-call Obstetric Anaesthetist (out of hours) who will initiate PCA.

Oxygen therapy should be prescribed and commenced.

Strong opioids and discharge plan

Some patients with sickle cell may be discharged on opioid analgesics. If the patient is discharged on opioids they should be informed how to self-administer opioid medication safely, wean analgesics and dispose of unused analgesic medications. Patients should be reminded to take particular care with storing opioids and other medicines that may be liable to misuse. They should be told of the dangers of driving or using machinery while taking opioid medicines, and a patient leaflet should be provided to reinforce these messages. Guidance should be given about medicine review following discharge from hospital. Usually 5 days and no more than 7 days of opioids should be prescribed. New prescriptions of modified-release opioid preparations should be avoided without specialist consultation. The hospital discharge letter must explicitly state the recommended opioid dose and duration and should be provided in a timely way and provided to all healthcare professionals involved in caring for the patient, including community pharmacists, to avoid an acute prescription of opioids inadvertently becoming a repeat prescription.

References

- Averbukh, Y et al. (2019) Patient-controlled Analgesia for Vaso-Occlusive Crisis: A Cohort Study. *Clin J Pain* 35(8), p. 686-690

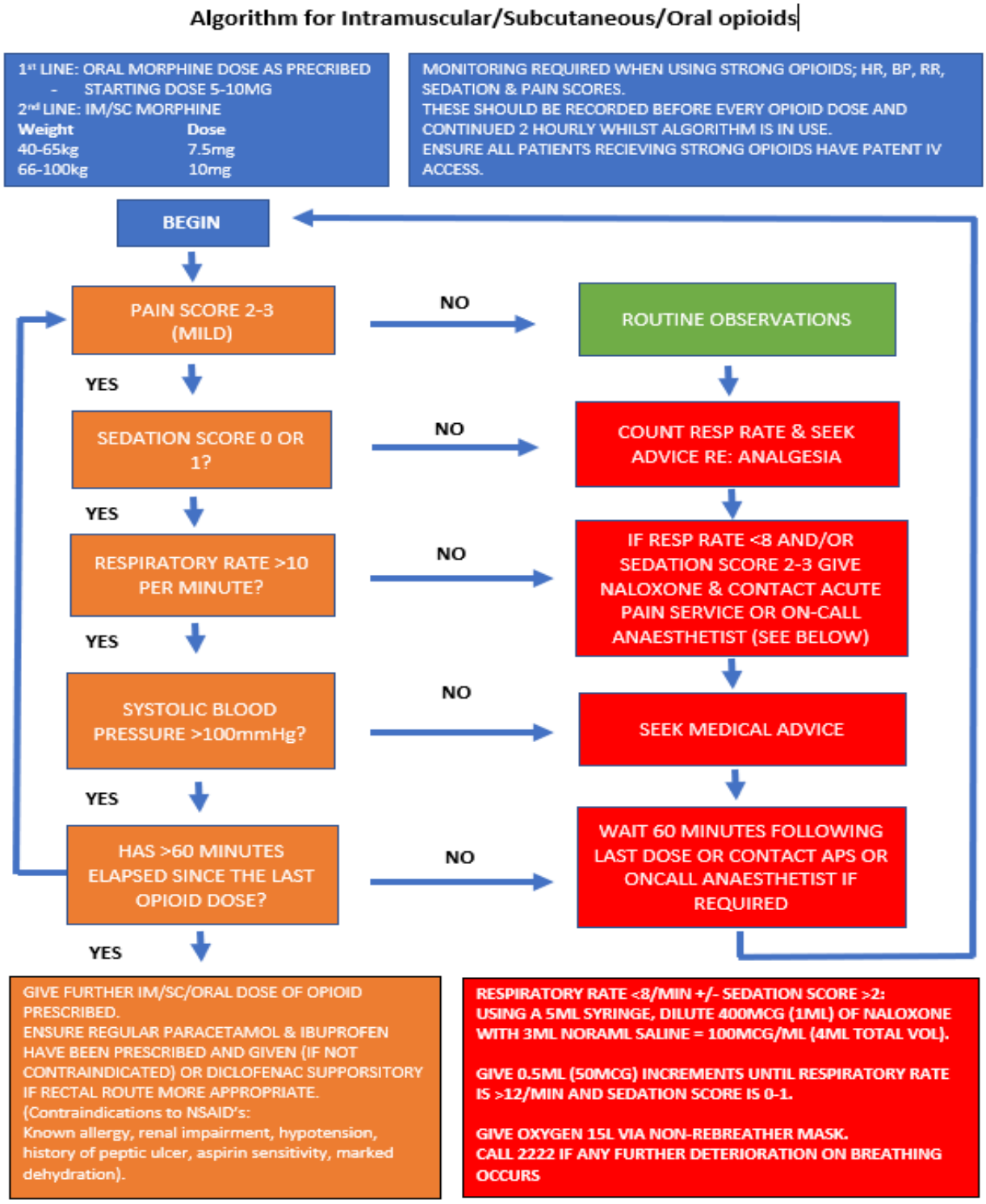
- Dorman, K. (2005) Sickle cell crisis! Managing the pain. *Registered Nurse* 68(12), p. 33-36

- Khoyratty, S. I. M, et al. (2009) Patient Controlled Analgesia. *BMJ* 339 [Online]. Available at: Patient controlled analgesia | The BMJ

- National Institute for Health and Care Excellence (NICE) (2012) *Sickle Cell Disease: Managing acute painful episodes in hospital.* CG143 [Online]. Available at: Overview | Sickle cell disease: managing acute painful episodes in hospital | Guidance | NICE

- Van Beers, E et al. (2007) Patient-controlled analgesia versus continuous infusion of morphine during vaso-occlusive crisis in sickle cell disease, a randomized controlled trial. *Am J Hematol*. 82(11), p. 955-960

Section 11- ALGORITHM FOR HOURLY INTRAMUSCULAR/SUBCUTANEOUS AND ORAL OPIOIDS



Section 12- THE ADMINISTRATION OF INTRAVENOUS MORPHINE

Definition

The safe administration of intravenous morphine using an algorithm driven by information derived from documented pain score, sedation score, respiratory rate, pulse, blood pressure, nausea score and oxygen saturation levels.

Indications

For the management of severe acute pain in patients who are unable to tolerate oral analgesia.

Prescription

The dose of morphine should be prescribed according to the patient's age and clinical condition. Naloxone and Ondansetron must also be prescribed to combat the potential side effects associated with the use of opioids.

Example of suitable prescription:
Morphine 1mg – 5mg every 2 ½ minutes. Maximum 10mg in 30 minutes.

There may be exceptional circumstances where larger IV morphine doses are required, for instance in opioid dependent patients.

Balanced analgesia

Balanced analgesia should be prescribed for all patients receiving intravenous opioid analgesia. Paracetamol and an NSAID (if not contraindicated) should be prescribed regularly with intravenous preparations and suppositories used where necessary.

Equipment

Every patient receiving IV morphine must have an intravenous cannula in situ – not only for the administration of the opioid, but also for administration of naloxone or an anti-emetic if necessary.

Designated clinical areas & responsibilities

Intravenous morphine may be administered in the Recovery room, Critical Care Unit, Emergency Unit and Coronary Care Unit. Staff should have been instructed in the safe administration of intravenous strong opioids.

Monitoring:

It is the responsibility of nursing staff to monitor and document pain severity scores, respiratory rate (respiratory rate should be recorded for a full minute), sedation score, pulse rate, blood pressure, oxygen saturation and nausea and vomiting level prior to administering each dose of IV morphine. These observations and recordings should continue at 5-minute intervals for 10 minutes after each morphine dose or for longer if the patient's condition dictates.

Management of complications or side effects

The Acute Pain Service algorithm **SECTION 11** should be followed to ensure the safe administration of intravenous morphine.

Should the patient develop hypotension, respiratory depression or have a sedation score of 2 or more, the instructions on the algorithm should be followed immediately.

References and Bibliography

- Aubrun F, Amour J, Rosenthal D, Coriat P, Riou B. (2007) Effects of a loading dose of morphine before intravenous morphine titration for postoperative pain relief. A randomized, double blind, placebo-control study. *Br J Anaesth*; 98:124–30

- Aubrun, F. Mazoit, J.-XRiou, B. (2012) Postoperative Intravenous morphine titration. *Br J Anaesth*; 108:193-201

- Bijur, Polly E. (2012) Dosing and titration of intravenous opioid analgesics administered to ED patients in Acute severe pain. *The American journal of Emergency medicine*; 30 (7):1241-1244

- White PF, Kehlet H. (2010) Improving postoperative pain management *Anesthesiology*. 112:220–5 doi:10.1258/jrsm.96.5.219

Section 13- ANALGESIA IN THE OPIOID TOLERANT PATIENT

In addition to this section, please see **Guidelines for the Management of Opioid-Dependent Individuals Admitted to UHW and Llandough Hospitals (2016).-** Guidelines for the management of opioid-dependent individuals exp 2019.pdf

Patients receiving opioids for chronic painful conditions should continue to receive their medication via an appropriate route and advice be sought from the APS regarding the management of their acute on chronic pain.

If prescribed opioids are being used prior to pain relieving surgery, it may be possible/necessary to reduce the dose post-operatively.

For patients taking illicit opioids there may be a need for an initial period of titration and conversion to prescription opioids. Liaison between The Acute Pain Service, Substance Misuse Liaison Nurse and the Community Drug and Alcohol team regarding these patients therefore needs to occur. These patients bring added complexities to the management of pain however they have the same rights and requirements for optimal pain relief as any patient.

For further information refer to ANZCA-Acute Pain Management Scientific Evidence 5th edition (2020) - Section 9.7 -The opioid – tolerant patient access link below.
https://www.anzca.edu.au › resources › apmse5

References and Bibliography

- ANZCA. (2020) *Acute Pain Management: Scientific Evidence (5th edn).* Melbourne: National Health and Medical Research Council.

- Gulur, P. 7 Nelli, AH. (2020) The Opioid Tolerant patient: opioid optimization. *The Journal of Arthroplasty.* 35 (6), 50-52.

- Kane, WJ. *et al.* (2021) Caring for the opioid dependent patient. *Seminars in Colon and Rectal Surgery*. 32 (3), 1-5.

- Macintyre, PE. *et a*l, (2020) Management of opioid- tolerant patients with acute pain: approaching the challenges. *Drugs.* 80 (1), 9-21.

- Stone, A. *et al*. (2020) Recommendations for managing opioid- tolerant surgical patients within enhanced recovery pathways. *Current Pain and Headache Reports*. 24 (6), 1-5

Section 14- ENTONOX

Definition

ENTONOX (50% nitrous oxide/ 50% oxygen medical gas mixture) is a fast-acting, inhaled analgesic that is particularly advantageous for treating short-term procedural pain.

ENTONOX is licensed for use across all age groups and as long as the person is able to activate the demand valve and understand instructions on how to use the equipment, then it is safe to use (see specific contraindications below). It is stored in cylinders at 137 bar and the pressurised mixture remains gaseous at temperatures above –6 degrees Centigrade.

Pulmonary transfer of nitrous oxide is rapid, with onset of effect in seconds and full analgesia within one to two minutes. Likewise, it is rapidly eliminated from the blood, via the lungs, when inhalation ceases. Entonox combines the analgesic effect of the nitrous oxide with the anti-hypoxic effect of 50% oxygen.

The nitrous oxide constituent of ENTONOX causes inactivation of vitamin B_{12}, which is a cofactor of methionine synthase. Folate metabolism is consequently interfered with, and DNA synthesis is impaired following prolonged administration of ENTONOX. **Prolonged or frequent use of ENTONOX may result in megaloblastic marrow changes, myeloneuropathy and sub-acute combined degeneration of the spinal cord. ENTONOX should not be used for more than a total of 12 hours within a 4-day period, without close clinical supervision and haematological monitoring.** Specialist advice should be sought from a haematologist in such cases. Haematological assessment should include an assessment for megaloblastic change in 56 red cells and hyper-segmentation of neutrophils. Neurological toxicity can occur without anaemia or macrocytosis and with B_{12} levels in the normal range.

In patients with undiagnosed subclinical deficiency of vitamin B_{12}, neurological toxicity has occurred after single exposures to nitrous oxide during general anaesthesia.

In patients taking other centrally acting depressant medicinal products, such as opioids and/or benzodiazepines, concomitant administration of ENTONOX may result in increased sedation and consequently have effects on respiration, circulation and protective reflexes. If ENTONOX is to be used in such patients, this should take place under the supervision of appropriately trained personnel. Where the patient has been exposed to agents which are toxic to the lungs, such as Paraquat, the use of gases containing more than 21% oxygen should be avoided.

Staff in the first trimester of pregnancy may wish to avoid the area while Entonox is in use.

Patients at higher risk include those:

• Who use Entonox frequently

• With a poor oral intake or on a diet low in animal products e.g. Vegans

• With malabsorption syndromes, particularly those with ileal resections

• On synthetic diets (e.g. phenylketonuria, maple syrup urine disease)

• On a diet for which special vitamin and mineral supplements are prescribed (more than standard vitamins such as abidec)

Indications

Entonox is indicated for the relief of acute, moderate to severe pain during short, painful procedures and for the pain of childbirth. Examples of such procedures include:

- Fracture manipulation
- Endoscopy (e.g. colonoscopy)
- Suturing of lacerations
- Venepuncture
- Wound dressing changes
- Burns dressing
- Orthopaedic joint manipulation
- Patient mobilisation / physiotherapy
- Wound drain removal
- Examination of wounds or fractures

Contraindications

Contraindications	Rationale
Pneumothorax Bowel obstruction Air embolism Decompression sickness or following a recent underwater dive Following air encephalography Severe bullous emphysema During myringoplasty	The nitrous oxide constituent of Entonox passes into all gas-containing spaces in the body faster than nitrogen passes out. This can cause expansion of the gas space, compressing surrounding structures.
Head injuries with impaired consciousness.	Entonox will cause sedation, which might confound neurological observation of the patient.
Drug or alcohol Intoxication	Drowsiness and aspiration would be a hazard in the event of vomiting.
Maxillo-facial injuries	The patient may not be able to hold the mask tightly to the face or use the mouthpiece adequately.
Heavily sedated patients	The patient may be unable to use the equipment properly and increased sedation may be hazardous.

Ensure the area is well ventilated during and after administration

Prescription

Entonox must be prescribed. Please use the Prescription Chart (**APPENDIX 16**) and attach / sign the pre-printed adhesive label to the In-Patient Medication Administration Chart.

Consent

Verbal patient consent must be obtained to administer Entonox and documentation of this consent should be made in the medical /nursing notes. A patient information leaflet should be provided to the patient prior to administration.

Equipment

Entonox demand apparatus is available in the Adult Surgical areas and from the pump library. The mouthpieces are available from CSSD. The equipment is regularly serviced and maintained by the Regional Anaesthetic Support Services unit who should be contacted if any problems are encountered with the equipment.

Designated clinical areas & responsibilities

Entonox may be used anywhere within the hospital if there are suitably trained qualified nurses to supervise its administration. As Entonox is a form of patient-controlled analgesia, it is the responsibility of the nurses to instruct the patient in its use.

Monitoring Requirements

Please follow the care plan (**APPENDIX 16**)**-** on the back of the Supplementary Prescription Chart). Entonox should only be administered by staff who are trained and competent in its use.

Training

Online Entonox Training can be completed here: https://www.boctraining.co.uk/login/index.php. You will need to sign up via BOC to access this free educational course. At completion of the course, you will be provided with a Certificate of Competence. Individual practitioners are responsible for keeping their own competency record. Please read BOC Entonox - Essential Guide for further information on the administration of Entonox or contact the Acute Pain Service on Bleep 5414.

Section 15 – FURTHER INFORMATION

TRAINING

It is a mandatory requirement within Cardiff and Vale University Health Board that any personnel using infusion devices, including those for intravenous PCA and Epidural / Regional analgesia, undergo training and competency assessment (Please refer to the Policy for the use of Parenteral Infusion Devices). Training is available via Clinical Engineering. Pain Management Study days are provided by the Acute Pain Team throughout the year. There are specific dates for Registered Nurses and HCSWs although other members of the multidisciplinary team are welcome to attend. Please arrange via LED.

IMPLEMENTATION

These guidelines are an update to previous guidelines. Throughout the formal pain management study days and informally in day-to-day clinical practice reference is made to the document. These guidelines can be used by the multidisciplinary team.

EQUALITY IMPACT AND ASSESSMENT

An equality impact assessment has been undertaken to assess the relevance of these guidelines to equality and potential impact on different groups, specifically in relation to the General Duty of the Race Relations (Amendment) Act 2000 and the Disability Discrimination Act 2005 and including other equality legislation. The assessment identified that the guidelines presented no risk to the Health Board.

FURTHER INFORMATION

For any further information or clarification in relation to paediatric peri-operative pain management practices please contact the Clinical Lead for Paediatric Anaesthesia via the Department of Anaesthetics or the Acute Pain Team on Bleep 5414.

AUDIT

Compliance with these guidelines will be audited continuously by the Acute Pain Service via the Acute Pain Service Clinical Workstation Database. Audit results will be discussed and distributed to each relevant clinical area.

DISTRIBUTION

These guidelines are available throughout the Health Board via the SharePoint system.

Appendix 1

NHS Number:	Date of Birth:
Hospital No.	Address:
Forename(s):	
Surname:	
	Postcode:

All Wales Pain Assessment

TO BE COMPLETED IN BLACK INK

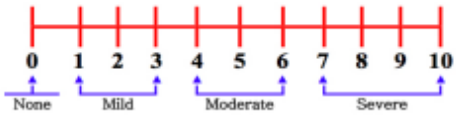
- ALL patients must have a pain assessment on admission and further evaluation as indicated in the frequency of pain assessment and analgesia administration
- Only **ONE** pain assessment tool should be used for each assessment (dependant upon the patient's level of communication at the time of the assessment - guidance below) and MUST be assessed on **movement / patient activity**

Use either the CATEGORICAL or NUMERICAL scale for patients who are able to VERBALISE their pain score:

CATEGORICAL SCALE

0	1	2	3
NO PAIN	MILD PAIN	MODERATE PAIN	SEVERE PAIN

NUMERICAL SCALE



Numerical Rating Scale	Equivalent Categorical Scale
0	NO PAIN
1-3	MILD PAIN
4-6	MODERATE PAIN
7-10	SEVERE PAIN

Use either the PAINAD (preferred within C&VUB) or ABBEY scale for patients who are unable to VERBALISE their pain score:

PAINAD SCALE

PAINAD	0	1	2
Breathing (Independent of vocalization)	Normal	Occasional laboured breathing. Short period of hyperventilation	Noisy laboured breathing. Long period of hyperventilation. Cheyne-stokes respirations
Negative Vocalisation	None	Occasional moan or groan / low level speech with a negative or disapproving quality	Repeated troubled calling out. Loud moaning or groaning. Crying
Facial Expression	Smiling or inexpressive	Sad Frightened Frown	Facial grimacing
Body Language	Relaxed	Tense. Distressed pacing. Fidgeting	Rigid. Fists clenched. Knees pulled up. Pulling or punching away. Striking out
Consolable	No need to console	Distracted or reassured by voice or touch	Unable to console, distract or reassure

PainAD Scale Total Score:	Equivalent Categorical Scale
0	NO PAIN
1-3	MILD PAIN
4-6	MODERATE PAIN
7-10	SEVERE PAIN

Score guidance for each category: (0, 1 or 2) when screening for pain related behaviours during activity (MAX=10)

ADAPTED ABBEY SCALE

Vocalisation (score 0-3)	Whimpering, groaning, crying
Facial Expression (score 0-3)	Grimacing, frowning, looking tense, looking frightened
Change in Body Language (score 0-3)	Fidgeting, rocking, guarding part of body, withdrawn
Behavioural Change (score 0-3)	Alterations in usual patterns, increased confusion, refusing to eat
Physiological Change (score 0-3)	Temperature, rapid pulse, blood pressure outside normal limits
Physical Changes (score 0-3)	Skin tears, pressure areas, arthritis, contractures

Adapted Abbey Pain Scale Total score:	Equivalent Categorical Scale
0-2	NO PAIN
3-7	MILD PAIN
8-13	MODERATE PAIN
14+	SEVERE PAIN

Acknowledgment:
Abbey, J; De Bellis, A; Piller, N; Esterman, A; Giles, L; Parker, D and Lowcay, B. Funded by the JH & JD Gunn Medical Research Foundation 1998 - 2002

Score guidance for each category: Absent = 0, Mild = 1, Moderate =2, Severe=3 (MAX=18)

Discuss with family / carers how the person usually reacts to pain (past and present). Ask about their usual behaviour patterns. Check any getting to know you forms such as "Read about Me", for individual pain behaviours. Record any particular pain behaviours in the sections above.

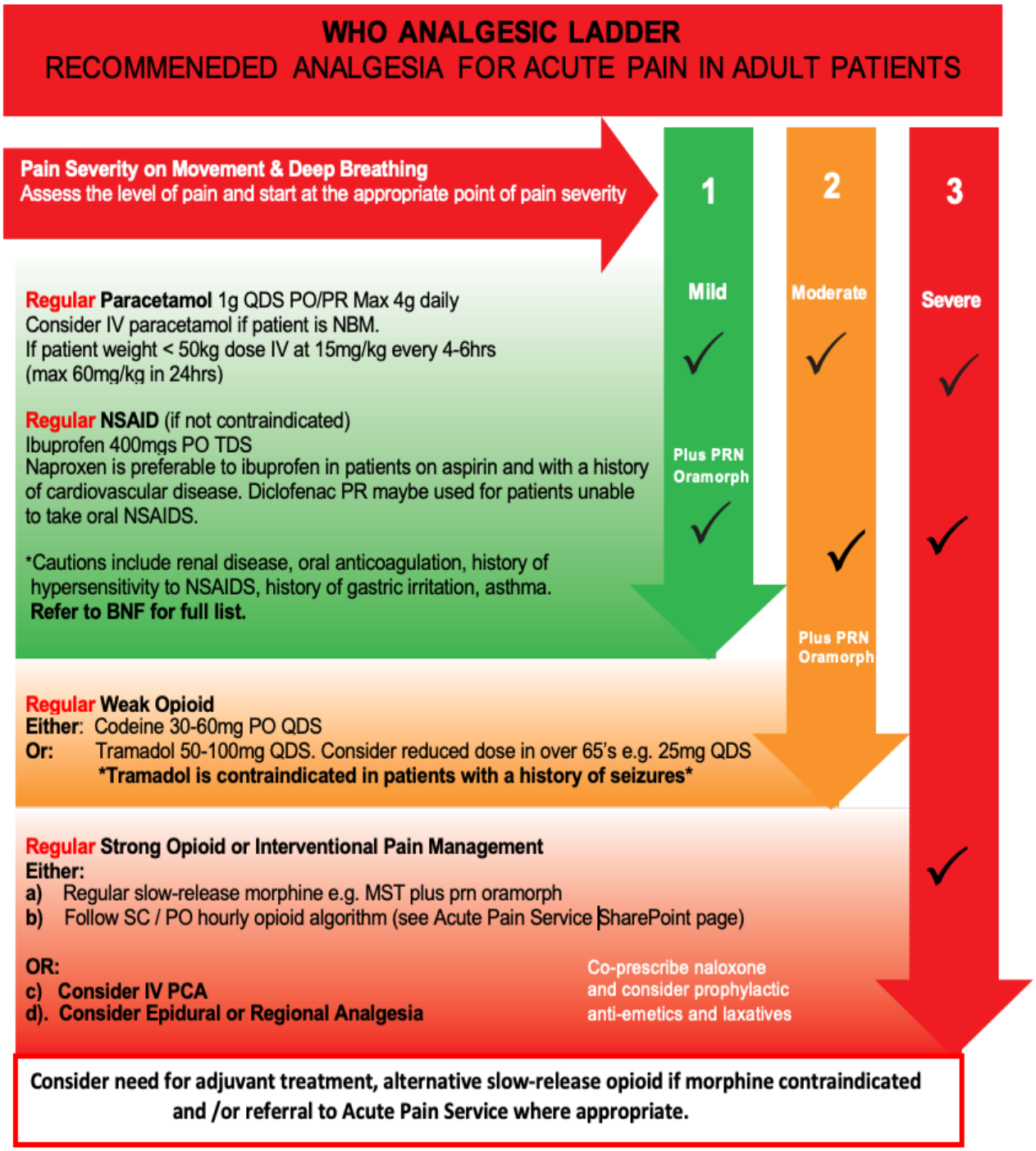
FREQUENCY OF PAIN ASSESSMENT AND ANALGESIA ADMINISTRATION

NO PAIN	MILD PAIN	MODERATE PAIN	SEVERE PAIN
Reassess 12-hourly as per NEWS observations	Give step 1 analgesia Reassess 4-hourly	Give step 2 analgesia Reassess after 30-60 minutes Ongoing assessment minimum 4-hourly	Give step 3 analgesia Reassess after 30 and 60 minutes Ongoing assessment minimum 4-hourly

Version: 2.4 (pilot release)
Approval Date: 29/04/2019
Approved by: Directors of Nursing

- Once the patient has been assessed, using the guidance, transcribe the pain score in to the Equivalent Categorical Pain Scale below (NONE, MILD, MODERATE, SEVERE)
- If an action is documented, the pain score must be re-evaluated at an appropriate interval (guidance on frequency overleaf in the frequency of pain assessment and analgesia administration box)›¢

Date & Time	Pain assessment tool used: (Choose only one tool to score)	Pain Score	Equivalent Categorical Pain Scale (see overleaf)				Action/comments	Signature
			NONE	MILD	MODERATE	SEVERE		
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							
	Categorical (N-M-M-S)		☐	☐	☐	☐	Details:	
	0-10							
	PainAD							
	Abbey							


WHO ANALGESIC LADDER
RECOMMENEDED ANALGESIA FOR ACUTE PAIN IN ADULT PATIENTS
Pain Severity on Movement & Deep Breathing
Assess the level of pain and start at the appropriate point of pain severity
1
Mild
2
Moderate
3
Severe
Regular Paracetamol 1g QDS PO/PR Max 4g daily
Consider IV paracetamol if patient is NBM.
If patient weight < 50kg dose IV at 15mg/kg every 4-6hrs
(max 60mg/kg in 24hrs)
Regular NSAID (if not contraindicated)
Ibuprofen 400mgs PO TDS
Naproxen is preferable to ibuprofen in patients on aspirin and with a history of cardiovascular disease. Diclofenac PR maybe used for patients unable to take oral NSAIDS.
*Cautions include renal disease, oral anticoagulation, history of hypersensitivity to NSAIDS, history of gastric irritation, asthma.
Refer to BNF for full list.
Plus PRN Oramorph
Plus PRN Oramorph
Regular Weak Opioid
Either: Codeine 30-60mg PO QDS
Or: Tramadol 50-100mg QDS. Consider reduced dose in over 65's e.g. 25mg QDS
Tramadol is contraindicated in patients with a history of seizures
Regular Strong Opioid or Interventional Pain Management
Either:
a) Regular slow-release morphine e.g. MST plus prn oramorph
b) Follow SC / PO hourly opioid algorithm (see Acute Pain Service SharePoint page)
OR:
c) Consider IV PCA
d). Consider Epidural or Regional Analgesia
Co-prescribe naloxone and consider prophylactic anti-emetics and laxatives
Consider need for adjuvant treatment, alternative slow-release opioid if morphine contraindicated and /or referral to Acute Pain Service where appropriate.

Acute Pain Service Referrals

If you are referring a patient to the Acute (in-patient) Pain Service, it would help us to prioritise your referral if you provide the following information:

S **Situation**	○ State your name and ward ○ I am calling about: patients name, DOB, hospital number, consultant's name ○ The reason I am calling is….
B **Background**	○ State the admission date, reason, and diagnosis ○ Relevant medical history ○ History of current regular / PRN analgesic regimen ○ Any history of chronic pain / long term opioid use / dependence, tolerance of opioids / alcohol dependence/ history of benzodiazepine use
A **Assessment**	○ State your assessment of pain score, sedation level, nausea & vomiting, and NEWS score ○ Give details of location, duration, and nature of pain ○ State the efficacy of current analgesic regimen ○ State any recent analgesic changes
R **Recommendation**	○ What is the urgency of the referral? Immediate or within 24hrs? ○ Can the medical team optimise current analgesic regimen prior to Acute Pain Service review? ○ Clarify expectations

Acute Pain Service Bleep 5414

Out of hours please contact on-call anaesthetist on bleep 5101(UHW) or 4800 (UHL)

Appendix 2

Patient information

What is PATIENT CONTROLLED Analgesia?

Patient Controlled Analgesia (PCA)

Patient controlled analgesia (PCA) is a type of pain relief that lets you give yourself small amounts of opioid painkiller into your vein as and when you need it. You are able to do this by pressing a button attached to a pump with the painkiller in it. This is a common way we deal with pain after an operation.

There are many benefits to using this type of pain relief:

- You can press the button to get some painkiller as soon as you feel or expect to feel pain. You do not have to call the nurse and wait for painkillers to be prepared.
- The amount of pain felt after an operation varies a lot from one person to another therefore PCA allows you to give the right amount of painkiller for you.
- Using PCA avoids repeated injections of painkillers as the drug is delivered straight into your bloodstream via the 'drip'.
- Some people feel much less anxious when they have some control over a situation. With PCA, you will have greater control over your pain relief.

This leaflet aims to increase your awareness of how you pain might be managed with PCA.

GIG CYMRU NHS WALES
Bwrdd Iechyd Prifysgol Caerdydd a'r Fro
Cardiff and Vale University Health Board

The amount of time for which you will need PCA will vary depending on the type of surgery you had, how quickly you are recovering and how much discomfort you have. You must be able to drink when the PCA is stopped so that it may be replaced with painkilling tablets. It is recommended that you take regular tablets for at least a further 2 or 3 days.

PCA is known to be an extremely safe method of pain relief and you will be closely monitored by nursing staff whilst using it. Its safety however relies on the fact that only you are allowed to press the button, making it virtually impossible to overdose. **Please do not allow any visitors to use the PCA for you.**

Some of your questions answered about PCA...

How do I give myself the painkiller?

The nurse in the Recovery Room after your operation will set up the PCA machine and the control button will be given to you. When you need painkillers, simply press the button once and release it. A pre-set dose of painkiller will be delivered by the machine straight into your bloodstream and you should feel some relief within about 5 minutes.

When do I press the button?

When you are resting in bed after your operation you can press the button which has a red light on it, as soon as the level of pain begins to increase. Do not wait until your pain is severe as the painkiller may not work.

If you need to move, for example, sit up, turn over or get out of bed, always press your button at least 5 minutes before doing so to get the maximum amount of relief. It is also advisable, if possible, to press the button a few minutes before any deep breathing, coughing or nursing procedure that may be uncomfortable.

Once you have pressed the button the red light will flash while the painkiller is being delivered into your blood stream. The light will continue to flash until the 5 minute lockout is up. During this time even if you press the button no painkiller will be delivered. This is a safety lockout. After 5 minutes the red light will come back on and a dose of painkiller will be available again when you press the button.

Will the painkiller run out if I use too much?

Do not worry about how much painkiller you are using. All the PCA machines are refillable and the nurse will do this as soon as it is required.

What should I do if the painkiller fails to work?

After pressing the button once, wait a few minutes to see whether the painkiller has worked. If you are now comfortable, do not press the button again unless the pain begins to increase or if you need to move. If you are still in pain, press the button again when the red light shows and wait a few minutes to give the painkiller a chance to work.

The red light is ON. If you have pain or need to move, press the button. A small amount of painkiller will be administered.

The red light continues to flash and the machine will NOT let you have another dose. The button will unlock after 5 minutes. You can press the button again when it lights up red.

This procedure can be repeated until you are comfortable. If, despite pressing the button several times, you are still in pain, please call the nurse. There may be a problem that can be easily fixed.

Finally...

We hope you found this information leaflet useful. If you have any questions or concerns about your pain control or the PCA, please ask your nurse.

Appendix 3

ADULT
INTRAVENOUS PATIENT CONTROLLED ANALGESIA PRESCRIPTION

Patient details Affix addressograph	Consultant Ward	Type of pump ARCOMED Bar code

Drug and concentration – please tick appropriate box

Morphine 2mg/ml	Bolus dose: mg	Lockout time: minutes A standard setting to suit most patients would be 1 mg bolus/5-minute lockout

- Bolus dose range 500 micrograms-3 mg
- Pre-filled syringes of morphine 2 mg/ml are only available in the Main Theatre recovery room.
- Bottles of morphine 2mg/ml are available in all other clinical areas where PCA is managed.

Fentanyl 25 micrograms/ml	Bolus dose: micrograms	Lockout time: minutes A standard setting to suit most patients would be 20 mcg bolus/5-minute lockout

- Bolus dose range 5 micrograms-30 micrograms
- Pre-filled syringes of fentanyl **<u>are not</u>** available. Fentanyl is available in 10ml ampoules of 50 micrograms/ml. To make a solution of 20 micrograms/ml draw up 20ml of fentanyl 50 micrograms/ml in a 50ml syringe and add 20ml of 0.9% Sodium Chloride of injection. Mix well.

Please affix PCA prescription sticker to as required section of medication chart. Naloxone and Ondansetron are included on the prescription sticker.

The Pain Management Service or anaesthetist may adjust the dose of morphine and fentanyl PCA bolus dose within the range specified above according to the needs of the patient.

Incremental boluses using the clinician override facility on the PCA device (up to the specified amount below) may be administered for the immediate post-operative period in recovery or by the Pain Management Service or Anaesthetist only.

Paracetamol and an NSAID (if not contraindicated) should be prescribed regularly for all patients receiving PCA

Incremental bolus doses to a maximum of ……. micrograms or mg

Date & time											
Amount											
Signature											

Prescribers signature	Print name	Date
Set up by	Checked & connected	Date

Unrelieved pain	Patient will have no more than mild pain at rest and mild to moderate pain on movement	Ensure that the patient is educated in the use of PCA. Provide patient information leaflets plus verbal instruction prior to initialising PCA. Provide on-going reminders to patient whilst PCA is in use. **If not contraindicated:** check that regular paracetamol and an NSAID have been administered in addition to PCA. This may reduce morphine requirement. Check that the intravenous cannula is patent. Check that the PCA administration set is unclamped and connected properly. Help position the patient comfortably. Advise patient to support wound when coughing/moving. **Pain assessment: pain should be assessed and recorded on movement** alongside other observation or more frequently if required.
Potential problems surrounding the safe administration of PCA. Incorrect: Drug/Concentration. Bolus. Lockout time. PCA device/giving set	PCA is safely administered PCA device delivers prescribed bolus with correct lockout time.	Ensure that controlled drugs are checked in accordance with the Cardiff and Vale University Health Board policy. Ensure that the syringe is correctly labelled, and contents correlate with the prescription chart. The PCA syringe should be checked hourly by **the qualified nurse caring for the patient** and the PCA record of administration chart should be completed. Any discrepancies should be reported to the APS / On-call Anaesthetist immediately, remove PCA button from the patient until the problem is resolved. When changing syringe and at shift handover, 2 qualified nurses **(including the qualified nurse caring for the patient)** should check the PCA settings, i.e. – the bolus dose, lockout time and continuous infusion, against the prescription chart. Ensure that a PCA giving set with anti-syphon and anti-reflux valve is in use.
Potential side effects	Early detection and treatment	**Monitor BP, pulse rate, respiratory rate and sedation score:** ½ hourly for 2 hours. When PCA is commenced or following any alteration to PCA regimen. Satisfactory, these observations may then be recorded 2 hourly for 48 hours a thereafter 4 hourly until PCA discontinued. When the patient is asleep and observations have been satisfactory, it is acceptable to record the respiratory rate only. A sedation score of 'S' should be recorded on the observation chart to indicate that the patient was asleep at the time the observation was made. Ensure no other opioids are given to the patient whilst receiving PCA. (Exceptions may occasionally be made but under the supervision of the APS only).

Respiratory depression	Respiratory Rate > 12/min	Respiratory rate should be counted **for a full minute**. If the respiratory rate falls to 9 or 10/min, remove the PCA button from the patient, give oxygen 15L via a well-fitting non-rebreather reservoir mask (ensure reservoir bag inflated) reassess every 5 minutes until respiratory rate > 12/min. If respiratory rate falls to <8/min, follow actions above, plus give **IV naloxone (*Dilute a 1ml ampule of naloxone 400mcg with 3mls of normal saline for injection to make a total of 4mls). Give in 50mcg (0.5ml)** increments **until respiratory rate >12/min.** Monitor O2 saturation continuously, ensure alarms set and audible.
Sedation score 2 or 3	Sedation score 0-1	If the sedation score is 2, remove PCA button, give oxygen 15L via a non-rebreather reservoir mask and monitor sedation level and respiratory rate. Record every 15 minutes. If the sedation score is 3, give oxygen 15L via a non-rebreather reservoir mask and administer naloxone as above until sedation score is 0-1. Monitor O2 saturation continuously ensure alarms are set and audible.
Oxygen saturation < 94%	Oxygen saturation >94%	If O2 saturation <94%, give oxygen 15L via a non-rebreather reservoir mask. If no improvement after 5 minutes, seek advice from the APS / On-call Anaesthetist. Consider pre-operative oxygen saturation level.
Nausea and vomiting	Early detection of nausea and prevention of vomiting	Assess for and record nausea and vomiting 2 hourly. Give prescribed anti-emetic p.r.n. when patient is nauseated. Give anti-emetic regularly, rather than as required, if nausea / vomiting is a persistent problem. Record effect and/or side effects of anti-emetic. Change anti-emetic if ineffective as per protocol for post-operative nausea or vomiting (Acute Pain Service Adult Guidelines – Appendix 1). If patient is nauseated shortly after pressing the PCA button and anti-emetic treatment ineffective, seek advice from APS or on-call anaesthetist.
Pruritus (itching)	Early detection and treatment	Assess and record any signs of itching. If the itching is distressing the patient: Administer IV Naloxone 50 mcg with caution. It will reverse the side effect of opioids without reversing analgesia. If pruritis continues to be problematic, it may be necessary to rotate to a n alternative opioid.

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Appendix 4

CARDIFF AND VALE UHB

NURSE → PATIENT CONTROLLED ANALGESIA PRESCRIPTION CHART

GIG CYMRU NHS WALES | Bwrdd Iechyd Prifysgol Caerdydd a'r Fro | Cardiff and Vale University Health Board

For use in Cardiac Intensive Care only

(Please attach to the patient's ward prescription chart)

Patient details:- **Name:** _____ **Consultant:** _____

Unit Number: _____ **Ward:** _____

NURSE CONTROLLED ANALGESIA – See appropriate algorithm either:
< 80 years **and** weight >50kg **OR** > 80 years **or** weight < 50kg*

***Delete as appropriate**

Fentanyl 25micrograms/ml
Prefilled syringes of Fentanyl are not available. Fentanyl is available in 10ml ampoules of 50micrograms/ml. To make a solution of 25micrograms/ml, draw up 20ml of Fentanyl 50micrograms/ml in a 50 ml luer lock syringe and add 20ml of Sodium Chloride 0.9% for injection, mix well.

Bolus Dose: _____ **Micrograms.** **(See appropriate algorithm)**

Lockout time: **2** **min.** **Document any changes to the NCA / PCA settings on the reverse of this form.**

Background Infusion rate: _____

Set by: _____ **Checked & connected by:** _____

Date: _____ **Time:** _____

For timely and appropriate conversion to PCA refer to appropriate algorithm. For conversion to PCA - adjustment of the lockout time and discontinuation of the background will be undertaken by an anaesthetist, pain team CNS or designated CITU nurse.

PATIENT CONTROLLED ANALGESIA

Fentanyl 25micrograms/ml

Prefilled syringes of Fentanyl are not available. Fentanyl is available in 10ml ampoules of 50micrograms/ml. To make a solution of 25micrograms/ml, draw up 20ml of Fentanyl 50micrograms/ml in a 50 ml luer lock syringe and add 20ml of Sodium Chloride 0.9% for injection, mix well.

Bolus Dose: _____ **Micrograms.**

Lockout time: **5** **min.**

Background Infusion rate: **NIL**

Set by: _____ **Checked & connected by:** _____

Date: _____ **Time:** _____

Prescriber Name: _____ **Prescriber Signature:** _____

Date: _____

CARDIFF AND VALE UNIVERSITY HEALTH BOARD

FENTANYL ALGORITHM FOR POST-OPERATIVE ANALGESIA – CICU ONLY

GIG CYMRU NHS WALES | Bwrdd Iechyd Prifysgol Caerdydd a'r Fro | Cardiff and Vale University Health Board

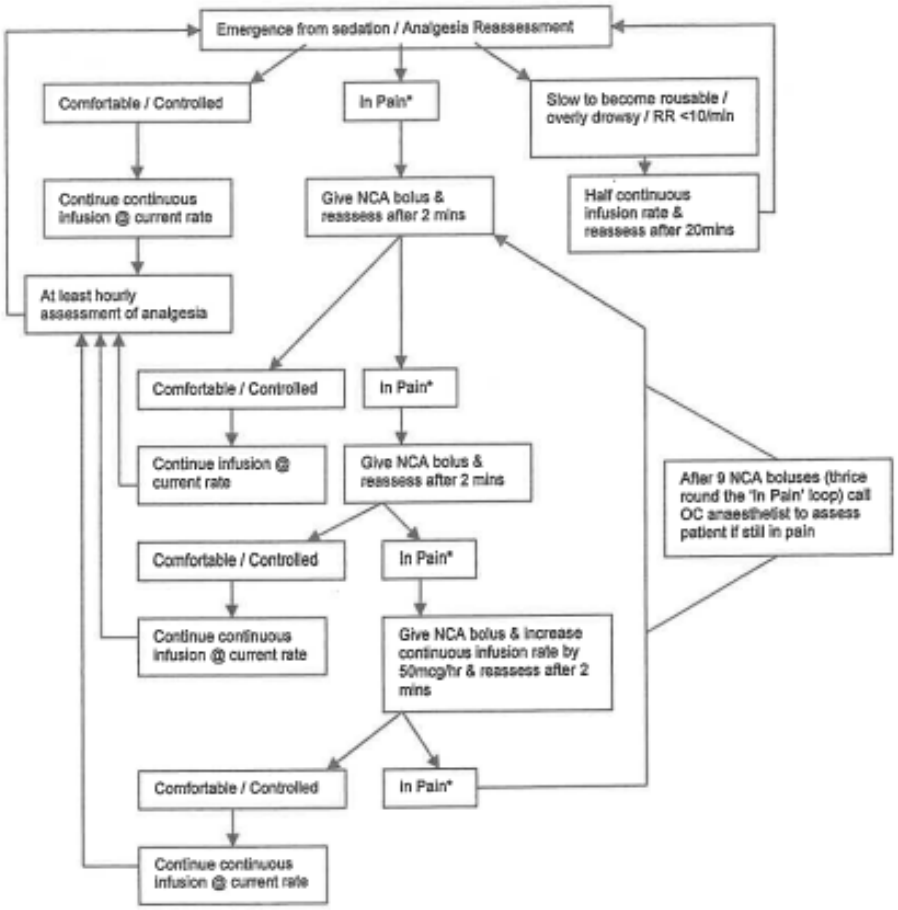
For Patients Age < 80yrs and Weight > 50Kg

Fentanyl 25micrograms/ml

Prefilled syringes of Fentanyl are not available. Fentanyl is available in 10ml ampoules of 50micrograms/ml. To make a solution of 25micrograms/ml, draw up 20ml of Fentanyl 50micrograms/ml in a 50 ml luer lock syringe and add 20ml of Sodium Chloride 0.9% for injection, mix well.

On return from theatre use the "CICU ONLY" protocol amended with the following Nurse Controlled Analgesia settings

Bolus dose	-	**20micrograms**
Lockout	-	**2min**
Continuous rate	-	**100micrograms/hr**



Change to PCA

Once the patient is judged to be capable of using the PCA facility appropriately the fentanyl algorithm above can be discontinued and the patient allowed to manage their own analgesia.

Bolus dose	-	**20micrograms**
Lockout	-	**5min**
Continuous rate	-	**NIL**

The nurse controlled infusion and above algorithm can be re-established should pain become a problem again or if it becomes apparent that the patient is not using the PCA appropriately.

*** Reporting Pain / Hypertensive / Tachycardic / Uncooperative / Agitated / 'fighting' the ventilator**

THIS IS ONLY A GUIDE – IF YOU ARE NOT SURE ASK

fentanyl algorithm for post-operative analgesia v2 0
Dr. R. Abel – Department of Anaesthetics

03 August 2010

CARDIFF AND VALE
UNIVERSITY HEALTH BOARD

FENTANYL ALGORITHM FOR POST-OPERATIVE ANALGESIA – CICU ONLY

GIG CYMRU NHS WALES | Bwrdd Iechyd Prifysgol Caerdydd a'r Fro | Cardiff and Vale University Health Board

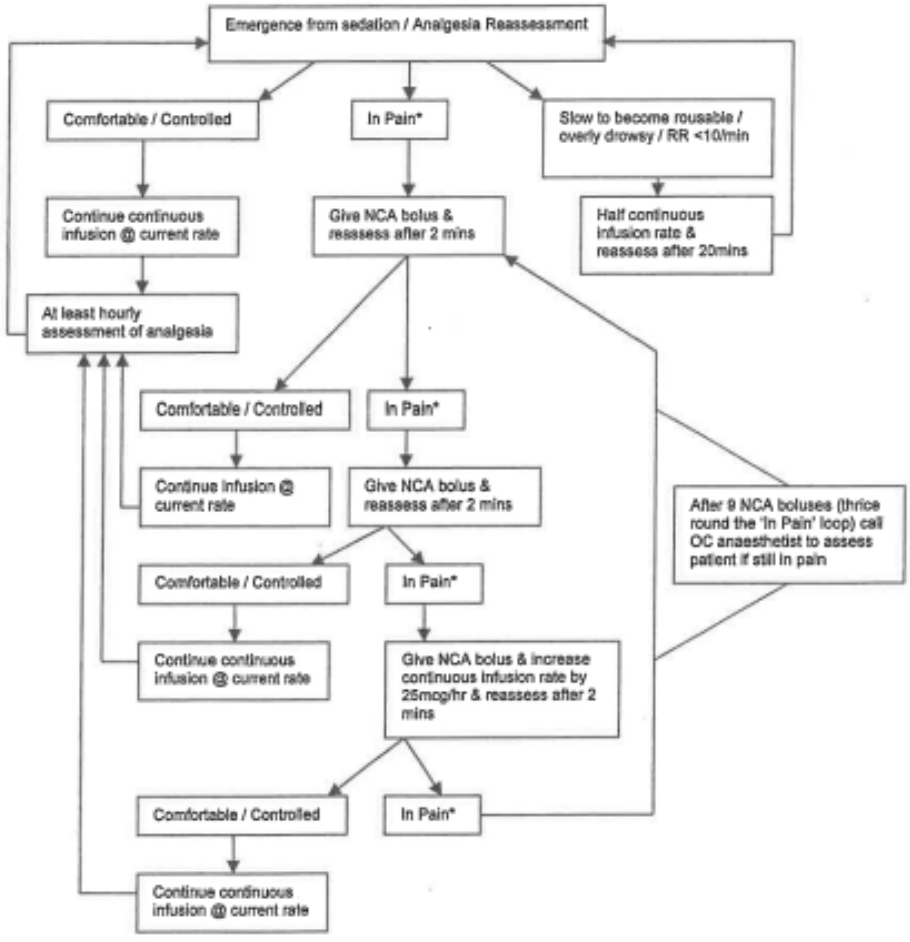
For Patients Age > 80yrs or Weight < 50Kg

Fentanyl 25micrograms/ml

Prefilled syringes of Fentanyl are not available. Fentanyl is available in 10ml ampoules of 50micrograms/ml. To make a solution of 25micrograms/ml, draw up 20ml of Fentanyl 50micrograms/ml in a 50 ml luer lock syringe and add 20ml of Sodium Chloride 0.9% for injection, mix well.

On return from theatre use the "CICU ONLY" protocol amended with the following Nurse Controlled Analgesia settings

Bolus dose	-	**10micrograms**
Lockout	-	**2min**
Continuous rate	-	**50micrograms/hr**



Change to PCA

Once the patient is judged to be capable of using the PCA facility appropriately the fentanyl algorithm above can be discontinued and the patient allowed to manage their own analgesia.

Bolus dose	-	**10micrograms**
Lockout	-	**5min**
Continuous rate	-	**NIL**

The nurse controlled infusion and above algorithm can be re-established should pain become a problem again or if it becomes apparent that the patient is not using the PCA appropriately.

*** Reporting Pain / Hypertensive / Tachycardic / Uncooperative / Agitated / 'fighting' the ventilator**

THIS IS ONLY A GUIDE – IF YOU ARE NOT SURE ASK

Appendix 5

Administering Epidural Bolus - Guidelines for Acute Pain Service and Anaesthetists ONLY

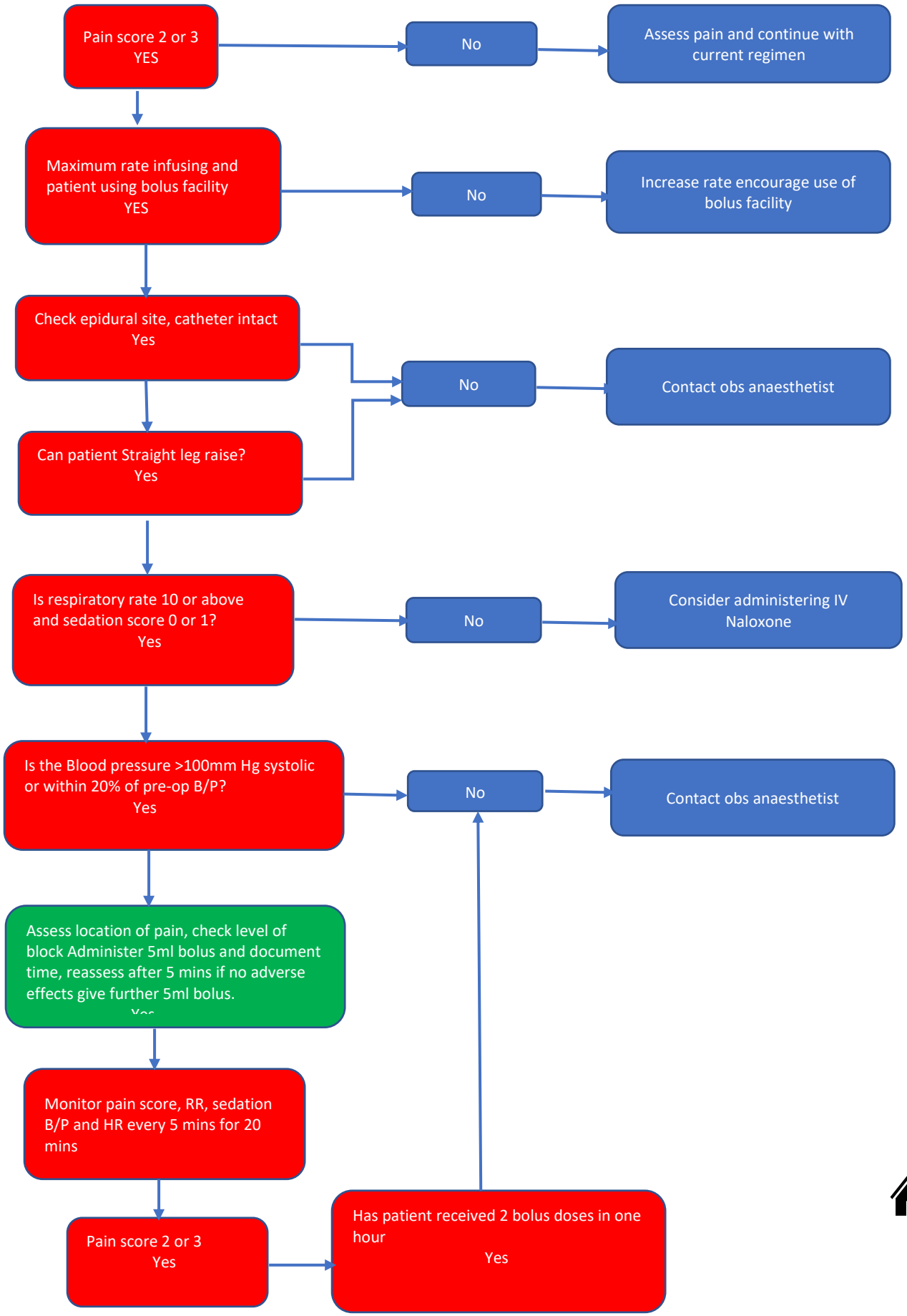
Anaesthetic staff and the Acute Pain Service administering an epidural bolus in the clinical areas should observe the following points:

- The patient should have patent venous access and be lying on a bed/trolley
- A test dose should be administered initially.
- 0.1% levobupivacaine plus fentanyl 2mcg/ml from the infusion pump should be used initially and particularly if the reason for pain is secondary to inadequate spread of LA.
- 0.25% levobupivacaine solution should only be used if the above has not worked and the patient describes breakthrough pain despite adequate spread of LA.
- The epidural bolus should be documented in the patient's medical notes and on the prescription chart.

- **Minimum period of monitoring following a bolus top up of an epidural should be every 5 minutes during the first 30 minutes following the administration of a top-up to manage any subsequent hypotension.**

If it is necessary to leave to attend an emergency, please ensure that the ward nursing staff have the correct bleep number and that of the duty anaesthetist, in case further help or assistance is required.

Flow chart for the administration of an epidural bolus via Bodyguard pump, to be administered by Acute pain service nurse or anaesthetists trained in the epidural device.



Appendix 6

Bromage Scale

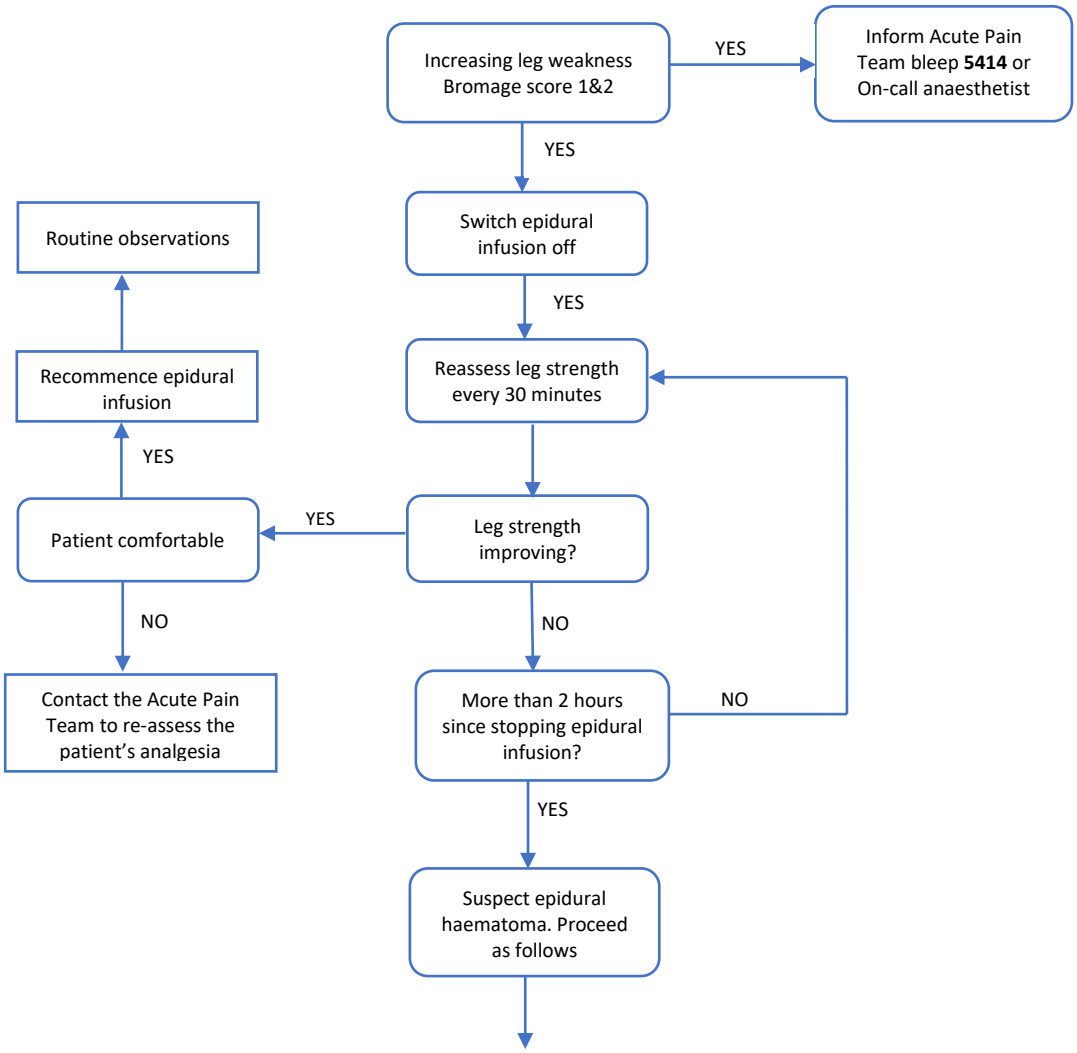
Score	Degree of motor block	
1	Complete block, unable to move feet or knees	
2	Able to move feet only	
3	Just able to flex knees; free movement of feet	
4	No block; full movement of knees and feet	

Reproduced with permission from Association of Anaesthetists & Obstetric Anaesthetist's Association Safety Guideline: Neurological monitoring after obstetric neuroaxial blockade (4).

Appendix 7

Management of leg weakness with epidural analgesia

All patients receiving epidural analgesia must have leg strength assessed as per Bromage Scale. Thoracic epidurals should not cause profound leg weakness. Increasing leg weakness usually means the infusion rate is too high. However, it may mean that the patient is developing an epidural haematoma. If not diagnosed and treated promptly, this will lead to paraplegia. Use this algorithm to differentiate.



During weekday office hours contact a member of the Acute Pain Team bleep **5414,** and out of hours contact the anaesthetist on -call**,** bleep **5101,** who will arrange an urgent spinal MRI via through the neurosurgical team on take. An epidural haematoma must be evacuated within **8 hours** of the onset of symptoms for the patient to have the best chance of recovery of neurological function. **DO NOT DELAY.**

The Association of Anaesthetist (2007)

Appendix 8

Cardiff and Vale University Health Board

Patients name:	Consultant:
	Ward:
	Date:
Type of pump and Barcode	Weight: kg

Adult Continuous Epidural Infusion

Select protocol

Inserting Anaesthetist..... Epidural insertion level ..... cm at skin .....

Continuous infusion only

A Levobupivacaine 1.25mg/ml (0.125%) (200ml container) ☐

B Levobupivacaine 1mg /ml (0.1%) + Fentanyl 2mcg (500ml container) ☐

Infusion rate range 0.9 - 12 mls/hr

Start Rate: mls/hr

Patient controlled epidural analgesia (PCEA) continuous infusion + bolus

D Levobupivacaine 1mg/ml (0.1%) + Fentanyl 2mcg (500ml container) ☐

Infusion rate range 0.9 - 12 mls/hr

Start Rate: mls/hr

Adult Regional Local Anaesthetic Continuous Infusion

Select Protocol

Type of nerve catheter.....

Continuous infusion only

H Levobupivacaine 1.25mg/ml (0.125%) (200ml container) ☐

Infusion rate range

.....to.....mls/hour

Start rate: 10 mls/hr for first 4 hours

Max Rate: 15mls/hr - Max total dose 400mg in 24hrs

Patient controlled regional analgesia (PCRA) continuous infusion + bolus

J Levobupivacaine 1.25mg/ml (0.125%) (200ml container) ☐

Infusion rate range

.....to.....mls/hour

Start rate: 10 mls/hr for first 4 hours Bolus: ..... mls

Max Rate: 15mls/hr - Max total dose 400mg in 24hrs

Prescriber's name..... Signature.....

Set by: ..... Checked and connected.....

Epidural / regional catheter removed?	Date	Time	Name	Signature

Problem	Goal	Nursing care
1.Unrelieved pain	Patient will have no more than mild pain at rest or on movement.	Record 2 hourly pain assessment. Check epidural or local anaesthetic infusion catheter connections and insertion sites for leakage. If there is a unilateral block (epidural) that is not covering the site of pain, lie patient on the painful side. If connections are secure, increase infusion rate within prescribed limits. If PCEA is being used check patient compliance and ask them to press the demand button. Check level of block if indicated. **If not contraindicated, give regular Paracetamol +/- NSAID. If pain persists despite epidural or local anaesthetic infusion running at maximum prescribed rate, seek advice from the Acute Pain Service (APS) / On-call Anaesthetist.** Do not routinely administer another opioid if the epidural solution contains Fentanyl
2.Potential problems surrounding the safe administration of analgesia	Administer epidural or regional local anaesthetic infusion safely as prescribed	Follow Cardiff & Vale UHB Controlled Drug Policy when Fentanyl is being administered epidurally. Follow Cardiff & Vale UHB drug administration policy, including 2-person initial check of epidural and regional local analgesia solution against prescription. Ensure that the giving set is labelled: **"NOT FOR IV CONNECTION"** Check infusion device settings hourly and complete infusion record of administration chart hourly as per C&V UHB Policy. At shift handover 2 qualified nurses check the infusion device, its programme and the amount remaining in the infusing bag to ensure all correspond with the prescription and record of administration charts. **These tasks should be completed by the qualified nurse caring for the patient and if this registered nurse has not yet undergone infusion device training, then a suitably competent nurse should oversee this process.** Any discrepancies should be reported **contact APS / On-call Anaesthetist immediately.**
3. Potential side effects / complications **Hypotension**	Early detection and treatment Early detection and treatment	Assess and record at **1/2 hourly** intervals for **2 hours** and the **2-hourly** sedation, nausea score, respiratory rate, pulse, B/P until infusions discontinued. Record temperature **4-hourly** and assess epidural or regional local anaesthetic infusion insertion site **6 hourly**. **Ensure patient has patent IV access throughout the duration of the infusion.** Check for signs of hypovolaemia. Increase IV infusion rate if necessary and as prescribed. If appropriate encourage intake of oral fluids. **Call APS / On-call Anaesthetist**. Ensure Ephedrine is available.

Respiratory Depression	Early detection and treatment	The respiratory rate should be counted for a full minute. If respiratory rate falls below the acceptable level for an adult **< 8 /minute,** switch off epidural and administer oxygen, give oxygen 15L via a face mask and if necessary, support ventilation with a pocket mask and rebreathing bag; Administer prescribed IV naloxone in 50mcg increments until respiratory rate >**12/minute.** Monitor continuously every 5 minutes. **Contact APS / On-call Anaesthetist for advice.**
Sedation score 2 or 3	Early detection and treatment	If sedation score is **2, STOP** epidural infusion give oxygen 15L via a face mask and monitor sedation level and respiratory rate every 5 minutes. If sedation score is **3,** administer 15L oxygen via a face mask. Give IV naloxone as above until sedation score is 0-1
SaO2<94%	Early detection and treatment	If oxygen saturations < 94%, give oxygen 15L via face mask. If no improvement after 5 minutes, contact **APS / On- call Anaesthetist.** Inform medical team caring for patient.
Opioid-induced Pruritus	Early detection and treatment	Administer a dose of naloxone if patient has opioid induced itching. IV naloxone 50mcg should be given to counteract the effects of itching, repeat as necessary. If problem unresolved contact **APS/ On-call Anaesthetist.**
Nausea and Vomiting	Early detection and treatment	Assess for nausea / vomiting every 2 hours and record on observation chart. Administer anti-emetic (see Acute Pain Service Adult Guidelines Nausea and Vomiting Protocol).
Potential displacement of epidural or local anaesthetic infusion catheter	Early detection and treatment	The insertion site should be covered with a transparent IV 3000, with the dressing's edges secured with Mefix tape. The infusion catheter should be secured with Mefix tape. The filter should be secured to the front of the patient over gauze swabs. Ensure the filter is in situ and all connections are secure. If they are not, **contact APS/ On-call Anaesthetist.** If catheter becomes displaced from filter - do not reconnect filter. **STOP** infusion and wrap end of catheter in sterile gauze. **Contact APS / On-call Anaesthetist** who will connect new filter until the line can safely be removed.
Local anaesthetic toxicity	Early detection and treatment	Observe patient for circumoral numbness, dizziness, light-headedness, fitting, twitching, drowsiness, ringing in the ears (tinnitus) and visual disturbances. **Critical symptoms of local**

		anaesthetic toxicity include unresponsiveness, fitting and cardiac arrest. **Contact APS / On-call Anaesthetist. STOP infusion immediately,** call adult resuscitation team **2222** and follow most recent adult in hospital resuscitation guidance. Intralipid is located in the main, short stay surgical recovery rooms University Hospital of Wales and main recovery room at University Hospital of Llandough.
Decreased or loss of motor function in legs (caused by local anaesthetic blockade, epidural space - potentially haematoma / abscess.	Early detection and treatment of epidural haematoma/abscess	**Epidural only** -every 2 hours ask the patient to straight leg raise (SLR) both legs. Record on observation chart. If patient unable to SLR please document motor block assessment with Bromage Scale and follow instructions for the 'management of leg weakness with epidural analgesia' flow chart. Once the epidural catheter is removed, assess SLR's every 2 hours for a further 24 hours. **If problem persists or pain inadequately controlled contact APS/On-call Anaesthetist.**
Epidural / regional local anaesthetic site /space infection	Early detection and treatment of epidural/ regional local anaesthetic site infection	**All epidural and regional local anaesthetic catheters must be removed within 5 days of insertion unless the Acute Pain Service or Anaesthetist indicate otherwise.** If the transparent dressing becomes loose or fluid pools beneath it, the insertion site must be redressed. Use an aseptic technique and carefully clean the site using forceps, sterile swabs, and sterile saline, rubbing in a circular motion from the centre to the periphery. Change infusion bags using aseptic technique. Check insertion site (ESC) 6-hourly for pus, inflammation, tenderness or leakage and record on observation chart and in nursing care evaluation. If any signs of infection, **contact the APS / On-call Anaesthetist to review.** If the epidural or regional local anaesthetic catheter is to be removed - Use aseptic technique. Clean the insertion site with sterile normal saline ensure the full length of the catheter is removed, that the end of the catheter is visualised, and this is documented in the notes, apply a transparent IV 3000 dressing over the site. **Guidance outlined under problem 4 within this care plan should also be followed when removing epidural catheters**.
Epidural / regional local anaesthetic site /space infection	Early detection and treatment of epidural/ regional local anaesthetic site infection	**If an epidural / regional local anaesthetic site infection is suspected**, **send tip and swab to Microbiology. If no concerns about severe or deep infection, consider flucloxacillin or doxycycline if penicillin allergy or suspected/high risk for MRSA.** **If known MRSA colonised- please review sensitivities and call Microbiology if needed. In pregnancy, alternative to doxycycline in penicillin allergy would be clindamycin. If there**

Epidural / regional local anaesthetic site /space infection	Early detection and treatment of epidural/ regional local anaesthetic site infection	**are any concerns about severe or deeper infection (i.e. epidural space collection) contact Microbiology for tailored treatment and management plan. For antibiotic doses see BNF.** If the insertion site becomes exposed, **please contact the APS / On-call Anaesthetist out of hours,** to review as the infusion catheter will probably need to be removed as outlined above. Once removed the epidural/ regional local anaesthetic insertion site should be observed for 3 days for signs of infection. If patient is discharged before the end of this 3-day period, the discharging nurse must ensure that either a community nurse conducts a day 3 check, or if appropriate the patient/carer is educated to check the epidural/regional local anaesthetic site. Ensure the patient has been provided with an epidural/ appropriate regional local anaesthetic analgesia patient information leaflet and understands the steps to be taken if a problem occurs.
4.Potentially unsafe removal of epidural catheter, resulting in epidural space haematoma >lower limb paralysis	Haematoma within epidural space and potential sequela is avoided. Safe and easy removal of epidural catheter.	**PRIOR TO REMOVAL OF EPIDURAL**: Check current FBC and clotting results prior to epidural catheter removal. **Platelets must be > 100 and APTT ratio must be < 1.4 and PT must be <24.** **Contact APS / On-call Anaesthetist** if any of these blood results are abnormal prior to removal of epidural. When the decision is made to remove the epidural catheter, consider the prescribed anticoagulant medication in conjunction with the timings below, as to when it is safe to remove the epidural catheter. **ENOXAPARIN: Prophylactic dosage: (e.g. enoxaparin 20mg or 40mg OD or BD) - 12 hours should elapse following last dose and epidural removal.** **Treatment dosage: > 40mg - 24 hours should elapse following last dose and epidural removal.** **WAIT 4 HOURS FOLLOWING EPIDURAL CATHETER REMOVAL BEFORE GIVING NEXT DOSE OF ENOXAPARIN.** **If an alternative Low Molecular Weight Heparin is prescribed – See Acute Pain Management Guidelines for guidance or contact APS bleep 5414/ On-call Anaesthetist out of hours for advice.** **DIRECT ORAL ANTICOAGULANTS (DOACs) SHOULD NOT BE GIVEN WHILST AN EPIDURAL IS IN SITU (e.g., RIVAROXABAN, APIXABAN, EDOXABAN OR DABIGATRAN).**

		IF A DOAC is inadvertently given whilst an epidural catheter is in situ, do NOT remove epidural catheter. **In relation to RIVAROXABAN, APIXABAN AND EDOXABAN at least 24 HOURS should elapse between the last dose and removal of the epidural catheter.** **WAIT 6 HOURS FOLLOWING EPIDURAL CATHETER REMOVAL BEFORE GIVING NEXT DOSE OF RIVAROXABAN, APIXABAN OR EDOXABAN.** **IF DABIGATRAN is inadvertently administered, do NOT remove the epidural catheter. A minimum of at least 48 HOURS RENAL FUNCTION DEPENDENT should elapse between the last dose and removal of the epidural catheter.** **WAIT 6 HOURS FOLLOWING EPIDURAL CATHETER REMOVAL BEFORE GIVING NEXT DOSE OF DABIGATRAN.** **Contact APS/On- call Anaesthetist for advice in relation to all DOACs.** **HEPARIN INFUSION**: - **Contact APS/On-call Anaesthetist for advice**. See Acute Pain Service Pain Management Guidelines. There needs to be close liaison between Surgical team and APS to optimise patient's treatment. **Oral Anticoagulant treatments e.g., Warfarin / Antiplatelets e.g., Clopidogrel, Prasugrel, Ticagrelor, Dipyridamole, Cilostazol. should NOT be administered whilst epidural analgesia being administered.** If the patient is prescribed any of these treatments or any oral anticoagulant/ antiplatelet drug following a cardiovascular event whilst receiving epidural analgesia, contact the On-call Consultant Anaesthetist urgently for advice **BEFORE GIVING** the new treatment (epidural catheter will need to be removed prior to commencing new oral anticoagulant and alternative analgesia will need prescribing). If patient is prescribed any anti-platelet / oral anticoagulant drug not indicated above, please **contact APS/ On call Anaesthetist** for advice.

Appendix 9

REMOVAL OF EPIDURAL CATHETER IN PATIENT RECEIVING CONCURRENT INTRAVENOUS HEPARIN INFUSION

Liaise with the surgical team regarding the proposed removal of the epidural catheter and the management plan for anticoagulation.

Stop intravenous heparin for 2 hours.

Obtain blood samples for APTT ratio, PT and for platelet count

APTT ratio should be 1.4 or less. If APTT ratio is greater than 1.4 send further sample for repeat APTT in 1 hour. (Keep heparin switched off). •

If APTT ratio is 1.4 or less, PT is less than 24 and platelet count greater than 100, remove epidural line as per guidelines.

Restart heparin 2 hours following the removal of the epidural catheter.

Any queries contact Acute Pain Service/On- call Anaesthetist:

UHW
Acute Pain Service - Bleep 5414 Obstetric on call Anaesthetist (out of hours) - Bleep 5101

UHL
Acute Pain Service - Bleep 4574 Duty on-call Anaesthetist (out of hours) - Bleep 4800

Appendix 10

AAGBI Management of Severe Local Anaesthetic Toxicity 2023

3-10 Local anaesthetic toxicity v.2

Signs of severe toxicity:

- Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions.
- Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur.
- Local anaesthetic toxicity may occur some time after an initial injection.

START

1. Stop injecting the local anaesthetic (remember infusion pumps).
2. Call for help and inform immediate clinical team of problem.
3. Call for cardiac arrest trolley and lipid rescue pack.
4. Give 100% oxygen and ensure adequate lung ventilation:
   - Maintain the airway and if necessary secure it with a tracheal tube.
   - Avoid hypercarbia – consider mild hyperventilation.
5. Confirm or establish intravenous access.
6. **If circulatory arrest:**
   - Start continuous CPR using standard protocols (→ **2-1**) **but**:
   - **Give** intravenous lipid emulsion (Box A).
   - **Use smaller adrenaline dose** (≤ **1µg.kg**$^{-1}$ instead of 1 mg)
   - Avoid vasopressin.
   - Recovery may take >1 hour.
   - Consider the use of cardiopulmonary bypass if available.

   If no circulatory arrest:
   - Conventional therapies to treat hypotension, brady- and tachyarrhythmia.
   - **Consider** intravenous lipid emulsion (Box A).
7. Control seizures:
   - Small incremental dose of benzodiazepine is drug of choice.
   - Thiopental or propofol can be used, but beware negative inotropic effect.
   - Consider neuromuscular blockade if seizures cannot be controlled.

Box A: LIPID EMULSION REGIME

USE 20% Intralipid® (propofol is not a suitable substitute)

Immediately

- Give an initial i.v. bolus of lipid emulsion 1.5 ml.kg^{-1} over 2-3 min (~100 ml for a 70 kg adult)
- Start an i.v. infusion of lipid emulsion at 15 ml.kg^{-1}.h^{-1} (17.5 ml.min^{-1} for a 70 kg adult)

At 5 and 10 minutes:

- Give a repeat bolus (same dose) if:
  - cardiovascular stability has not been restored or
  - an adequate circulation deteriorates

At any time after 5 minutes:

- Double the rate to 30 ml.kg^{-1}.h^{-1} if:
  - cardiovascular stability has not been restored or
  - an adequate circulation deteriorates

Do not exceed maximum cumulative dose 12 ml.kg^{-1} (70 kg: 840 ml)

Box B: CRITICAL CHANGES

Cardiac arrest → Check already done 1 to 5, then → 6

Box C: AFTER THE EVENT

Arrange safe transfer to appropriate clinical area
Exclude pancreatitis: regular clinical review, daily amylase or lipase
Report case on your local critical incident system and to the relevant national system (these vary between each devolved nation and in Ireland)

3-10

Appendix 11

Acute Pain Service Adult Intrathecal Opioid Analgesia Care Plan

Problem	Goal	Nursing care
1.Unrelieved pain	Patient should not have more than mild pain at rest and mild to moderate pain on movement	Assess and document pain scores every 2 hours, or more frequently, if necessary. Administer regular prescribed Paracetamol/ NSAIDs (if not contraindicated). Give PRN Morphine SC/orally as prescribed 1 hourly. If this is ineffective, a prescription for PCA may be required. Contact the Acute Pain Service (APS)/ On call Anaesthetist.
2. Potential Side effects	Early detection and treatment.	For 24 hours, assess and document sedation score, respiratory rate, pulse rate, blood pressure, temperature, and oxygen saturation and nausea/vomiting scores. Observations should be recorded at ½ hourly intervals for 2 hours and then2 hourly for 24 hours.
a) Respiratory rate <8/min and or sedation 2 or above	Respiratory rate>12/min	Give oxygen 15 litres /min, monitor oxygen saturation levels, via a non-rebreather mask and give IV Naloxone in 50mcg increments and repeat until respiratory rate >12/min and or sedation 2 or above- contact the APS/ On call Anaesthetist. The respiratory rate should be recorded for a full minute.
b) Oxygen saturations <94%.	Oxygen saturations>94%	Administer oxygen 15 liters/min via a non-rebreather mask. If oxygen saturation has not improved after 5 minutes, seek advice from APS/ On call Anaesthetist
c) Nausea and vomiting.	Early detection of nausea and prevention of vomiting	Administer prescribed anti-emetics, 8 hourly. If nausea persists, contact APS/ On call Anaesthetist
d) Itching.	No itching	Assess patient for itching. If troublesome administer IV Naloxone 50 mcg, repeat if necessary. If itching persists, please contact APS/ On call Anaesthetist
e) Urinary retention.	No urinary retention	Please record urine output on fluid balance chart. If patient has not passed urine for 12 hours postoperatively and/or is experiencing pelvic discomfort, contact medical staff for review.

Please contact the Pain Management Service Bleep 5414 (UHW), Out of hours Bleep 5101 (UHW) or Bleep 4800 (UHL) with any queries

Appendix 12

Adult Intravenous Ketamine Continuous Infusion Prescription

N.B. Ketamine 10mg in 1ml is therapeutically equivalent to Esketamine 5mg in 1ml
Esketamine is no longer in use. Only Ketamine Infusions should be prescribed.

Patient details: Affix addressograph	Consultant	Type of pump
	Ward	Bar code
Mass of Drug: **Ketamine 200mg**	Diluent: **0.9% Sodium Chloride**	Total volume: **50mls**
Final Concentration: **4mg/ml**	Continuous Infusion Rate: **2-10mg/hr**	Route: **Intravenous**

Continuous Infusion ONLY (no bolus dose)

Ketamine must also be prescribed using the pre-printed label and fixed on the "as required" side of the medication chart.

The dedicated PCA infusion device has a pre-programmed protocol for a Ketamine infusion, which can be titrated according to effect and tolerance. Please ensure PCA handset has been **removed** from infusion device. A dedicated giving set, incorporating an anti-reflux and anti-siphon valve must always be used with these infusions.

Only the Acute Pain Service or Anaesthetist should adjust the rate of the Ketamine Infusion.

Ketamine is available in a 20ml vial of 10mg/ml (total 200mg in 20mls).

Balanced analgesia: The Ketamine infusion will be used as an adjunct to opioids. Paracetamol, weak or strong opioids, non-steroidal anti-inflammatory drugs (unless contraindicated) and local anaesthetics can be used concurrently with the Ketamine Infusion.

The Ketamine Infusion should NOT exceed **5 days**.

Prescribers Signature:		Date:	Setup by:	Connected by:
Prescribers Name (print):				
Recovery room nursing staff: Prescription calculations and infusion device settings to be checked before return to ward		Connected by:		Checked by:

Acute Pain Service 2021

Date	Problem	Goal	Nursing Care
	1. Unrelieved pain	Patient will have no more than mild pain at rest and on movement.	Check that the intravenous catheter is patent. Check that the administration set is unclamped and connected properly. Administer prescribed analgesics e.g. Paracetamol, NSAID, weak/strong Opioid. If pain score remains 2, call Acute Pain Service (APS) or Obstetric on call anaesthetist. Record and document 1 hourly pain assessment alongside other observations (See section 3). Has the Ketamine infusion been increased to the maximum tolerable dose?
	2. Potential problems with administration	Ketamine is safely administered.	The Ketamine infusion should be checked hourly by the qualified nurse caring for the patient and a record of administration chart should be completed. Any discrepancies should be reported to the APS/ On-call Anaesthetist immediately, stop the continuous infusion until the problem is resolved. Ensure that the Ketamine is infused as a continuous infusion via a locked PCA infusion device. When changing syringe and at shift handover, 2 qualified nurses (including the qualified nurse caring for the patient) should check the Ketamine prescription against the dedicated PCA infusion device settings and ensure that the syringe is correctly labelled, and contents agree with the prescription chart. Check and record pump checks hourly including handover/ syringe changes.
	3. Potential side effects: a) Respiratory depression /arrest	Early detection and treatment. Respiratory rate > 12/minute	Initially for the first 2 hours following commencement of the infusion, respiratory rate, pulse, B/P and O2 saturation and nausea/vomiting should be monitored every 30 mins and following this hourly for the duration of the Ketamine infusion. The respiratory rate should be counted for a full minute. If the respiratory rate falls to 9 or 10/min, stop the Ketamine infusion, withhold Opioid analgesia, give oxygen 15 litres/min via a non-rebreather face mask, reassess every 5 minutes until respiratory rate > 12/min. If respiratory rate falls to ≤ 8/min, follow actions above, in addition give IV Naloxone as respiratory depression may be associated with the Opioid analgesia, (* Dilute a 1 ml ampoule of Naloxone 400 mcg with 3mls of normal saline for injection to make a total of 4mls). Give in 50 mcg (0.5ml) increments until respiratory rate > 12/min. Monitor respiratory rate and oxygen saturation continuously until patient is stable. **Contact Acute Pain Service or Obstetric on call Anaesthetist immediately.** **If patient has respiratory arrest. Stop the Ketamine infusion.** Stop all other medications which could be contributing to the sedation. **Call the arrest team on 2222** and resuscitate as per CPR guidelines. Administer 15litres of oxygen via a bag-valve mask or pocket mask. Administer Naloxone as above if Opioid toxicity is suspected. If breathing, maintain airway, monitor respiratory rate and oxygen saturations, and give 15litres of oxygen per minute via a non-rebreather mask. Check circulation. **If pulse less: call the arrest team on 2222** and resuscitate as per CPR guidelines.

	b) Sedation Score 2 or 3	Sedation score: 0-1	**Contact Acute Pain Service or Obstetric on call Anaesthetist.** If the sedation score is 2, stop Ketamine infusion, and withhold Opioid analgesia, give oxygen 4l/min and monitor sedation level and respiratory rate. Record every 15 minutes. If the sedation score is 3, give oxygen 15l/min, via a non-rebreather mask, administer Naloxone (if sedation is thought to be due to Opioid analgesia) as stated in section 3b until sedation score is 0-1. Monitor O2 saturations continuously and check and record respiratory rate every 5 minutes. Contact the APS/ On-call Anaesthetist.
	c) Oxygen Saturations <94%	O2 saturations: > 94%	If O2 saturations <94%, give oxygen 15l/min. If no improvement after 5 minutes, seek advice from APS/ On-call Anaesthetist (Consider patients baseline oxygen saturation level prior to commencing Ketamine/Opioids. Contact APS/On-Call Anaesthetist if concerned only).
	d) Dysphoria problematic or distressing	Early detection and prevention	Contact Acute Pain Service on 5414 or obstetric Anaesthetist on 5101 to reduce infusion rate.
	4. Potential problem with discontinuing Ketamine infusion	Safe weaning and discontinuation of the Ketamine infusion	The Ketamine infusion should not be stopped abruptly as this could cause side effects. Please seek advice from the Acute pain team/on call Anaesthetist prior to discontinuing the Ketamine infusion. The Ketamine infusion should not **exceed 5 days** unless the Acute Pain Service stipulate otherwise. The Ketamine infusion needs to be slowly titrated down prior to discontinuing in order to prevent undesirable side effects.

Only Nursing Staff trained and assessed as competent on the PCA infusion device should care for patients receiving these infusions.

Please contact the Pain Management Service Bleep 5414 (UHW), Out of hours Bleep 5101 (UHW) or Bleep 4800 (UHL) with any queries"

Appendix 13

CONTINUOUS INTRAVENOUS LIDOCAINE PRESCRIPTION CHART

Patient Details (affix addressograph)	Consultant:	Type of Pump:
	WARD:	Bar Code:

Prior to prescribing Intravenous Lidocaine please complete the following checklist:

	YES	NO
Explicit consent obtained where possible?		
Prescribed by a Consultant Anaesthetist / Intensivist experienced in use of Lidocaine Infusions?		
Dosage calculation based on Ideal Body Weight if BMI > 30?		
Weight > 40kg		
All drug interactions checked as per eBNF?		
Checked that there are no contraindications to intravenous lidocaine?		
Checked that no other, or within the period of action of other, local anaesthetic interventions (see protocol for further information) have been administered?		
If patient using topical lidocaine patches; have these been removed?		
Is patient in a Critical Care Environment?		
Pre-printed prescription label signed and attached to PRN side of medication chart?		
Dedicated intravenous cannula?		
Dedicated prescription of N/Saline 0.9% to infuse at min rate 10mls/hr to run alongside infusion?		
Intralipid 20% for local anaesthetic toxicity is readily available & in date?		

If any ticks in **NO** Column, continuous intravenous Lidocaine should **NOT** be prescribed.

PRESCRIPTION:

Actual WEIGHT: .....**Kg** (*Min weight 40kg)*

Use Ideal Body Weight (IBW) for drug calculation if BMI > 30: **IBW**.....**Kg**

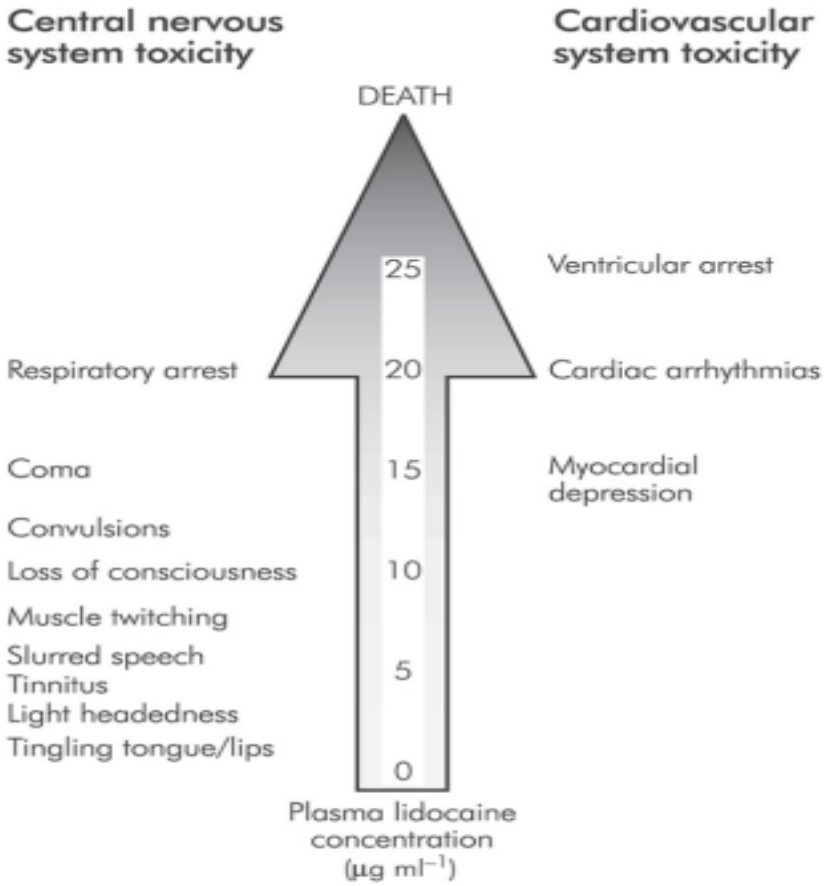
DRUG:	**Lidocaine 1%**		
Concentration:	**10mg/ml**		
Diluent:	**NONE**		
Total Volume:	**50mls**		
Rate Range:	**0.25mg/kg/hr – 1.5mg/kg/hr (max dose 120mg/hr)**		
Starting Rate:	..... **mg/kg/hr**		
Duration:	..... **hours** (maximum 24hours).	Time infusion to be stopped:	.....
Prescribers Name:		Setup By:	Checked By:
Prescribers Signature:			
DATE:			

PLEASE REMOVE HANDSET FROM PCA PRIOR TO CONNECTING INFUSION DEVICE TO PATIENT

Calculate Ideal Body Weight by Height (cm) - 105 = IBW for women in kg; Height (cm) - 100 = IBW for men in kg

Lidocaine prescription booklet 9-21

MONITORING:



Typical diagram relating plasma lidocaine concentration to toxic effects (Lin et al 2016, Fundamentals of Anaesthesia, 4th edn. Cambridge: Cambridge University Press)

Following setting up of an intravenous Lidocaine Infusion patient should have:

- **Continuous ECG and Oxygen saturation monitoring**.

Additionally, a full vital observations (including sedation and pain scores) plus assessment for local anaesthetic toxicity should be performed:

- **Every 15 min for the first hour,**
- **Then hourly as a minimum thereafter** (increased as necessary depending on patient condition).

Neurological symptoms and signs of local anaesthetic toxicity are the earliest and include **perioral tingling, tinnitus, light-headedness** and **restlessness**. Particular vigilance is needed in patient with existing comorbidity

INTRAVENOUS (IV) LIDOCAINE INFUSION CARE PLAN FOR POST OPERATIVE ADULT PATIENTS

Date	Problem	Goal	Nursing Care
	1. Unrelieved pain	Patient will have no more than mild pain at rest and mild to moderate on movement and coughing, not inhibiting such.	**Pain assessment:** Pain should be assessed and recorded on movement & coughing alongside other observations, plus more frequently if required. Check that the intravenous catheter is patent. Check that the administration set is unclamped and connected properly. Check whether the Lidocaine infusion has been increased to the maximum tolerable prescribed dose. Ensure that regular, prescribed analgesics such as; Paracetamol, NSAID +/- opioids are administered as appropriate. If I.V. PCA is also being used check that the patient understands and is compliant with the system. **Seek advice from the Acute Pain Service (APS) / On call anaesthetist if pain persists.**
	2. Potential problems surrounding the safe administration of I.V. Lidocaine	I.V. Lidocaine is safely administered.	**I.V. Lidocaine to be used in Recovery or Critical Care areas only and discontinued before patients are returned to any other clinical area.** Ensure that the I.V. Lidocaine is infused as a continuous infusion via an appropriate infusion device and that the device settings and syringe labelling correspond with the prescription. Mandatory checks for the lidocaine I.V. infusion are: **1.Hourly check** by the qualified nurse caring for the patient. Administration chart to be completed. **2.Handover check** by 2 qualified nurses (including the qualified nurse caring for the patient): Check the I.V. Lidocaine prescription against the device settings and the syringe labelling to ensure that they correspond with the prescription. **Any discrepancies or concerns should be immediately reported to the APS / on call anaesthetist and the continuous infusion stopped."**
	3.Potential side effects	Early detection and treatment	***CAUTION Refer also to relevant post –operative and I.V. PCA care plan if in use*** Continuous monitoring of ECG and oxygen saturations are mandatory during the infusion of I.V. lidocaine. Hourly observation and documentation of NIBP, respiration rate, nausea & vomiting, and sedation score.
	a) Suspected local anaesthetic toxicity	Early detection and treatment	**Observe for signs and symptoms of local anaesthetic toxicity**: peri-oral numbness, dizziness, ringing in the ears (tinnitus), light headedness, twitching, tremors, seizures, metallic taste, confusion, agitation, altered vision, hallucinations, bradycardia, hypotension, hypertension (early sign), sedation, respiratory depression STOP the infusion if there are any signs of local anaesthetic toxicity. Contact the APS / On call Anaesthetist. **Guidance re. local anaesthetic toxicity can be found in the Acute Pain Service Guidelines (Adult)** Most symptoms will resolve with cessation of the infusion within 1-2 hours. It can then be recommenced at a reduced rate following discussion with the APS / anaesthetist. In the event of severe local anaesthetic toxicity for example hypotension, bradycardia, loss of consciousness or confusion the infusion must be immediately stopped. Contact a Consultant Anaesthetist. If the patient is unresponsive, please follow the most recent Adult In-Hospital Resuscitation Guidance, assessing ABCDE & calling Adult Resuscitation team on 2222, if appropriate. **NB** Intralipid is located in Main Theatre Recovery (UHW) and Cavoc Theatres Recovery Area (UHL).

	b) Respiratory depression / arrest	Respiratory rate > 12/ minute	The respiratory rate should be counted for a full minute (min). If the respiratory rate falls to 9 or 10 / minute, stop the IV Lidocaine infusion, withhold Opioid analgesia, give oxygen 15 litres/ min via a non-rebreather face mask and reassess every 5 mins until respiratory rate > 12/ min. If the respiratory rate falls to ≤ 8 /min, follow the actions above, in addition give IV Naloxone (*****SEE BELOW) if respiratory depression is associated with the use of opioid analgesia. Contact the APS or on call anaesthetist immediately. ***Naloxone** – Dilute a 1ml ampoule of Naloxone 400mcg with 3mls of normal saline for injection to make a total of 4mls. Give in 50mcg (0.5ml) increments until respiratory rate > 12 / min. Monitor respiratory rate and oxygen continuously until patient is stable. If patient has a respiratory arrest **STOP** the IV Lidocaine infusion. Stop all other medications which could be contributing to the sedation. **If signs of life** assess ABCDE, recognise and treat, administer oxygen and monitor. Call Adult Resuscitation team by phoning 2222 if appropriate. Contact APS or on call anaesthetist. **If no signs of life** immediately call the Adult Resuscitation Team on 2222 and resuscitate as per Resuscitation Guidelines. Contact APS or on call anaesthetist. If the sedation score is 2, stop the IV Lidocaine infusion and withhold any opioid analgesia. Give oxygen 4L/min and monitor sedation score and respiratory rate.
	c) Sedation score: 2-3	Sedation score: 0-1	If the sedation score is 3 give oxygen 15l/min, via a non-rebreathable mask, administer Naloxone (*****SEE 3b) if sedation is thought to be opioid induced until sedation score is 0-1. Monitor oxygen saturation levels continuously and check and record respiratory rate every 5 minutes. Contact the APS/ on call anaesthetist.
	d) Oxygen (O2) saturations **<**94%	O2 saturations >94%	If O2 saturations <94%, give oxygen 15l/ min. If no improvement after 5 minutes, seek advice from the APS / on call anaesthetist. **NB** Consider patients baseline oxygen saturation prior to commencing IV Lidocaine/ opioids and contact the APS / on call anaesthetist if concerned only.

In accordance with the most recent Cardiff and Vale UHB Parenteral Infusion Pumps Policy

Training and assessment in the use of the dedicated infusion device is mandatory for ANY nurse managing a patient with an IV Lidocaine infusion.

(University Hospital of Wales) Acute Pain Service: bleep 5414, out of hours on call anaesthetist: bleep 5101

Appendix 14

RIB FRACTURES

A SCORING TOOL TO DETERMINE THE PROBABILITY OF SERIOUS COMPLICATIONS POST BLUNT CHEST WALL TRAUMA

Age:	Rib Fractures:	Chronic Lung Disease:	Pre Injury Anticoagulant:	Oxygen Saturation on room air:	Total Risk Score:
Score 1 point for every complete 10 years i.e. 63 years = 6 points	Score 3 points for every rib fractured. Flail: score 3 x 2 points for every flail rib	e.g. asthma, COPD, smoker. If yes score 5 points	If yes score 4 points	≤94% - 2 points ≤89% - 4 points ≤85% - 6 points	

Apply total risk score to appropriate column below and follow the guidance.

Apply principles of WHO analgesic ladder to provide analgesia based on rib fracture score and clinical presentation.

Assess pain on deep breathing, cough and movement using none, mild, moderate or severe.
For patients with communication difficulties use the C&V UHB Pain Assessment Toolkit in conjunction with "Show me Where"

Risk score 0-10
13% Probability
Refer to Pain Team. If pain persists/increases consider IV PCA

Risk score 11-15
29% Probability
Refer to Pain Team. If pain persists consider epidural

Risk score 16-20
52% Probability
Refer to Pain Team and Senior Anaesthetic Review. If pain persists consider epidural

Risk score 21 -25
70% Probability

Risk score **26-30**
80% Probability

Risk score 31+
88% Probability

Urgent referral to Pain Team & urgent Senior Anaesthetic Review Bleep 5101 or Vocera 40131

Epidural Analgesia – consider coagulation / coagulation therapies
Regular NSAID – If not contraindicated
Regular paracetamol

WHO ANALGESIC LADDER

RECOMMENDED ANALGESIA FOR ACUTE PAIN IN ADULT PATIENTS

Pain Severity on Movement & Deep Breathing
Assess the level of pain and start at the appropriate point of pain severity

1 Mild ✓ Plus PRN oramorph ✓
2 Moderate ✓ ✓
3 Severe ✓ ✓ ✓

Regular Paracetamol 1g qds po/pr. Max 4g daily.
Consider IV paracetamol if patient is NBM.
If pt weight<50kg dose IV at 15mg/kg every 4-6hrs (max 60mg/kg in 24hrs)

Regular NSAID (if not contraindicated)
Ibuprofen 400mg PO TDS
Naproxen is preferable to ibuprofen in patients on aspirin and with a history of cardiovascular disease. Diclofenac PR may be used for patients unable to take oral NSAIDs.

*Cautions include renal disease, oral anti-coagulation, history of hypersensitivity to NSAIDs, history of gastric irritation, asthma.
Refer to BNF for full list.

Regular Weak Opioid
Either Codeine 30-60mg po qds.
Or Tramadol 50-100mg qds. Consider a reduced dose in the elderly e.g. 50mg tds.

Plus PRN oramorph

Regular Strong Opioid or Interventional Pain Management
Either:
a) Regular Slow Release Morphine e.g. MST, plus prn oramorph
b) Follow prn im/sc/po hourly opioid algorithm (see intranet page)
Or:
c) IV PCA if risk score > 11
d) Epidural if risk score > 16 ANAESTHETIC REVIEW

Co-prescribe naloxone and consider prophylactic anti-emetics and laxatives.

If standard analgesic options are contraindicated e.g. when dealing with very frail elderly patients with significant co-morbidities, the use of a 5-7 day course of lidocaine 5% patches overlying the rib fractures (12 hours on 12 hours off) for inpatient use only may provide benefit.

Acute Pain Service, Bleep 5414. Anaesthetist bleep 5101, Vocera 40131.

Appendix 15

ANALGESIC MANGEMENT OF PATIENTS WITH BLUNT CHEST TRAUMA.

ON ADMISSION:

Please ensure that patient's analgesia is prescribed on the In-Patient Medication Administration Record Chart and administered:

- **Regular** IV paracetamol 1g QDS (dose adjust if < 50kgs and caution in liver disease).
- **Regular** lidocaine plaster 5% 12hrs on / 12hrs off. Max x 3 plasters per application within a 24hour period.
- Consider whether patient could have an NSAID (400mg ibuprofen TDS, with PPI cover 30mg lansoprazole, monitor creatinine if NSAID appropriate) and /or a regular weak opioid (codeine or tramadol).
- If pain is reported as moderate to severe - consider commencing a regular strong opioid e.g. MST 5mg BD or longtec 5mg BD, to optimise baseline analgesia (if no contraindications).
- **PRN** breakthrough oral strong opioid (morphine / oxycodone) e.g. 2.5 – 10mg oramorph or 2.5- 5mg of shortec hourly or subcutaneous morphine 2.5-5mg or oxycodone 2.5mg- 5mg hourly.
- **PRN** anti-emetic e.g. ondansetron 4mg TDS or cyclizine 50mg TDS
- **PRN** naloxone 200mcg in case of opioid toxicity (to be given incrementally in 50mcg).
- **Regular** laxatives senna 15mg BD and laxido 1-2 sachets BD.

Contraindications to NSAIDs:

- CKD stage 4 or 5 (eGFR <30ml/min)
- AKI
- Congestive cardiac failure
- Hepatic failure
- History of GI bleed or perforation
- Peptic ulcer
- Allergy to NSAIDs
- Asthma *with known exacerbation by NSAIDs*
- Clotting/platelet abnormalities

Caution to NSAIDs:

- Age > 65
- CKD stage 3 (eGFR 30-60ml/min)- **ONLY** if other analgesic options exhausted **(Always-discuss with pharmacist and consultant regarding short course).**
- CKD stage 1 or 2 and has structural kidney disease
- Blunt chest trauma

Caution with tramadol – may need to avoid or use lower dose (25mg):

- Elderly > 65
- Frailty score > 4
- Pre-existing delirium or cognitive impairment
- Previously poorly tolerated
- **Avoid** in epilepsy

If a patient has a **Rib Fracture Score ≥ 25** please list onto the **MTC list** or out of hours, the **CEPOD list** for a regional analgesic technique

Refer to Acute Pain Service (APS bleep 5414) or Obstetric Anaesthetist out of hours (Bleep 5101).

D1-D5 POST ADMISSION:

If patient is finding that pain is preventing them from deep breathing, coughing, or mobilising:

- Ensure that regular analgesics on the In-Patient Medication Administration Record chart have been administered.
- Ensure **PRN** breakthrough analgesia has been given?
- **If PCA in situ:**
  - Ensure the patient understands concept and is using appropriately pre-emptivley. Provide information leaflet to reinforce use and understanding.
  - Check that IV cannula is patent.
  - Consider whether tramadol or a long-acting opioid, such as MST or longtec, can be added to the regular side of the In-Patient Medication Administration Record Chart to optimise baseline analgesia.

If above interventions are not effective, please contact APS (bleep 5414) or Obs Anaesthetist out of hours (Bleep 5101) for review

All patients will be reviewed daily by the APS

ANALGESIC MANGEMENT OF PATIENTS WITH BLUNT CHEST TRAUMA

- **If a regional analgesic infusion is running:**
  - Increase rate within prescribed parameters.
  - Consider whether the concentration of the infusion could be increased (within safe limits of 2mg/kg/4hrs).
  - Consider whether tramadol or a long-acting opioid such as MST or longtec, could be added to the regular side of the In-Patient Medication Administration Record Chart to optimise baseline analgesia.
  - Provide patient with an information leaflet to reinforce understanding of regional analgesia.

- **If epidural infusion is running:**
  - Check that the epidural catheter is secured in place correctly and has not migrated out of the space (cm's skin documented on Epidural Prescription Chart).
  - Increase rate within prescribed parameters.
  - Encourage patient to utilise PCEA function.
  - Provide patient with an information leaflet to reinforce understanding of epidural analgesia.
  - Consider whether tramadol or a long-acting opioid, such as MST or longtec, could be added to the regular side of the In-Patient Medication Administration Record Chart to optimise baseline analgesia.
  - If no improvement in pain relief, contact APS or Obs Anaesthetist (out of hours) for administration of a clinician bolus via the epidural pump or if need be, a stronger bolus concentration down the epidural catheter.

N.B epidurals / regional analgesic infusions usually only remain in situ for **5 days**. Prior to discontinuing, please ensure adequate alternative oral analgesia is prescribed.

Do **NOT** wean epidural infusions if pain is well controlled and the patient is cardiovascularly stable.

STEP DOWN ANALGESIA:

If PCA in situ:

- Consider stopping PCA when patient can eat and drink
- Consider starting a long-acting opioid 12hrs prior to stopping PCA, if not already prescribed and ensure adequate **PRN** analgesia is prescribed on the In-Patient Medication Administration Record Chart, encourage the patient to request pre-emptively to facilitate mobilisation and physio.
- Ensure patient is on regular laxatives.

If regional / epidural analgesia is being utilised:

- **APS** will write plan in notes for discontinuation of these infusions.
- These are usually discontinued on D4 or 5 post insertion.
- Ensure **regular** oral analgesia is prescribed prior to discontinuing (consider long-acting opioid 12hrs before stopping infusion if not already prescribed) and ensure adequate **PRN** analgesia is prescribed on the In-Patient Medication Administration Record Chart and encourage patient to request pre-emptivley to facilitate mobilisation and physio.
- Ensure patient is on **regular** laxatives.

If utilising oral analgesia:

- Consider reduction of opioids after day 7(sooner if pain well controlled).
- If patient is being transferred or discharged home on opiates write plan on **TTH** for opiate reduction schedule and provide information leaflet regarding this.
- Ensure lidocaine plaster prescriptions are reviewed every 72hrs and are discontinued after maximum of 10 days.
- Ensure patient is on **regular** laxatives.

If above interventions are not effective, please contact APS (bleep 5414) or out of hours Obs Anaesthetist (bleep 5101) for review.

All patients will be reviewed daily by the APS

Appendix 16

ENTONOX PRESCRIPTION CHART

FOR ACUTE PROCEDURAL PAIN ONLY

Patient Details (affix addressograph)	Consultant:	Allergies:
	Ward:	Weight:
Date:	Drug: **ENTONOX**	Pharmacy:
Route: **Inhalation**	Concentration: **50:50 Nitrous Oxide : Oxygen**	**Self-Administration ONLY**

Special Instructions:	Frequency:
Must only be administered by staff who have had training in the use of Entonox. Please complete pre-printed label and stick on medication chart	ENTONOX should not be used for more than a total of 12 hours within a 4 day period To be discontinued after procedure

Contraindications:

- artificial, traumatic or spontaneous pneumothorax
- air embolism
- decompression sickness
- following a recent dive
- following a head injury
- following air encephelography
- severe bullous emphysema
- use during myringoplasty
- gross abdominal distension
- in patients having received recent intraocular injection of gas
- in patients who are intoxicated

Special Precautions:

1. Repeated or prolonged exposure to nitrous oxide depletes the body's stores of vitamin B12 and very rarely this can precipitate neurological complications. **Patients at higher risk include those:**
   a. Who use Entonox frequently,
   b. With a poor oral intake or on a diet low in animal products eg. Vegans,
   c. With malabsorption syndromes, particularly those with ileal resections,
   d. On synthetic diets (eg. phenylketonuria, maple syrup urine disease),
   e. On a diet for which special vitamin and mineral supplements are prescribed (more than standard vitamins such as abidec)
2. Ensure the area is well ventilated during and after administration
3. Staff in the first trimester of pregnancy may wish to avoid the area while Entonox is in use
4. **ENTONOX should not be used for more than a total of 24 hours, or more frequently than every 4 days, without close clinical supervision and haematological monitoring (please see APS Guidelines).**

Prescribers Signature:

Bleep No:.....

Please refer to the Acute Pain Management Guidelines (Adult or Paediatric) for further guidance or contact the Acute Pain Service on Bleep 5414.

ASSESSMENT	RATIONALE
INITIAL ASSESSMENT	
Assess the degree of pain likely for the procedure being performed	To determine whether Entonox is required
Ensure that Entonox is not contra-indicated for the patient	To reduce the likelihood of complications
Assess individual patient for the ability to use Entonox. The patient should be able to • Understand simple instructions (via an interpreter if necessary) • Hold the demand valve and inhale the gas through the mask or mouthpiece while breathing normal.	To ensure the patient can use Entonox effectively If Entonox is considered inappropriate for either the patient or the procedure, alternative analgesia should be prescribed.
PREPARATION	
Ensure the Entonox has been prescribed on patient's drug chart or if administered under a patient group directive (PGD) in the medical/nursing notes.	Entonox is a 'prescription only 'medicine
If Entonox is to be administered more frequently than every four days or for more than 24 hours, routine blood cell counts should be performed and referral to Haematologist for assessment	To observe for evidence of megaloblastic change in red cells & reduced production of leucocytes
The area should be well ventilated to prevent the accumulation of nitrous oxide	To maintain a safe environment. The occupational exposure standard for long term exposure is 100 parts per million (ppm)
Staff should be trained in the use and applications of Entonox	To allow staff to be aware of the side effects & occupational exposure limits of Entonox
Gather and prepare the following equipment: • Turn Entonox cylinder on and prime the administration set by pressing the test button on the back of the demand valve. • Check the cylinder to ensure it is at least a quarter full. If it is not, arrange for a new cylinder. • Attach the filter to mask or mouthpiece before attaching this to the demand valve	To ensure immediate availability of Entonox once inhalation commences To reduce risk of infection
Entonox cylinders should be checked carefully before use to ensure they contain the correct mix of 50% nitrous oxide and 50% oxygen	To prevent drug errors as stronger concentrations of nitrous oxide are available in the hospital in similar cylinders
To prepare the patient: • Consider the patient's suitability for use of Entonox, including their ability & motivation to self-administer the gas. • Ensure that the gas is entirely self-administered by the patient to reduce the incidence of over sedation. • Obtain informed consent • The patient does not need to be fasted. • Explain the procedure to the patient including other options available for pain relief should the need arise. Similarly, explain the potential benefits and side effects anticipated, with emphasis on how the Entonox might make the patient feel. • Show the patient the equipment to be used and demonstrate the noise associated with inhaling through the demand valve - allow the patient to practice inhaling the gas prior to starting the procedure to ensure that he/she can activate the demand valve and is confident and competent with the equipment. • Ensure the patient is in a comfortable and safe position.	To relieve anxiety and determine level of co-operation It is extremely important that the patient, rather than the nurse, hold the mouthpiece during administration of the gas to prevent excessive sedation The patient may need considerable encouragement to start inhaling the gas. It is worth persevering as any initial reluctance usually disappears once the patient realises that the Entonox is working To ensure an effective technique is established. *If the patient is unable to maintain an effective seal or inhale the gas effectively the use of Entonox should be abandoned and alternative analgesia and/or sedation should be prescribed*
Give supplementary analgesia as prescribed: • Oral or rectal drugs should be given some time before starting the procedure, to allow full effect. • The patient may continue to use their PCA if one is in progress	To provide additional pain relief
ADMINISTRATION	
To administer the Entonox: • Ask the patient to breathe normally throughout the procedure. • Allow the patient to inhale gas for a few minutes prior to commencing the procedure to ensure full analgesic effect	To establish an effective inhalation technique To ensure Entonox has taken effect before introduction of painful stimuli
MONITORING	
Once administration has commenced: • The patient should continue to use the Entonox as required throughout the procedure and should be encouraged to breathe slowly and deeply - if the patient hyperventilates, they should be encouraged to exhale slowly.	To provide effective analgesia with minimal side-effects To prevent hyperventilation.

Assess the patient throughout the procedure to determine: • The level of pain (using an age-appropriate pain assessment tool) • The presence of any side-effects • Whether they are using the Entonox effectively	To ensure that adequate pain relief is provided with minimal side-effects
Entonox related side-effects include: • Earache • Dizziness or disorientation • Dry mouth • Over sedation • Nausea & vomiting • Parasthesia in hands and nose	If the patient experiences any Entonox related side-effects, they should be reassured and cease inhalation until the side-effects wear off. It may be necessary to stop the procedure until alternative analgesia and/or sedation has been prescribed and given
If the patient complains of earache inhalation should be stopped and alternative analgesia prescribed	To prevent perforation of the eardrum.
A dry mouth is a common side effect but is not usually distressing. The patient should be encouraged to continue inhaling the Entonox.	To provide effective analgesia
If the patient starts to feel dizzy or disorientated, they may cease inhalation until the sensation starts to wear off and the sensation of pain starts to return. The patient may choose to put up with these sensations and continue inhalation to maintain effective pain relief.	To provide effective analgesia with minimal side-effects
If the patient becomes drowsy the seal around the mask or mouthpiece is lost and they will no longer inhale the gas. It is essential that only the patient holds the mask/mouthpiece	To prevent the onset of deeper stages of analgesia and sedation and loss of protection of the laryngeal reflex
Oxygen saturation must be monitored throughout the procedure if there is a history of respiratory or cardiac problems.	For early identification of any hypoxia
If the patient complains of nausea, they should be encouraged to cease inhalation if they wish Less commonly the patient may vomit. If so: • Remove the demand valve immediately • Reassure the patient and clear any obstruction to breathing • Clean and replace face mask/mouthpiece • Clear vomit from the demand valve by vigorously shaking it using a "flicking" downward action. • The patient may then recommence administration if they wish	The side-effects of Entonox wear of quickly once inhalation ceases To prevent inhalation of vomit N.B. The side-effects of Entonox wear off quickly once inhalation ceases
TECHNICAL PROBLEMS	
If any of the following technical problems occur, they should be reported to clinical engineering immediately: • Equipment not delivering gas • Leak at joint between regulator and cylinder valve • Demand valve leaks or does not shut cleanly • Demand valve does not stop giving flow after test button is released	To ensure equipment is safe and in good working order
COMPLETING PROCEDURES	
After use: • Ensure the patient is comfortable • Check the cylinder gauge for contents - If less than 1/4 full, replace the cylinder in readiness for next use • Turn off the cylinder and depressurise the system fully by operating the test button	To ensure that there is an adequate supply of Entonox for the next patient. To prevent misuse and to maintain a safe ward environment.
Monitoring should continue for 30 minutes to ensure that the effects of the Entonox have completely worn off. Accordingly, patients should not walk around unaided until any dizziness or disorientation has gone and should be advised to avoid driving or operating machinery for 30 minutes following administration.	To maintain patient safety
If the patient has respiratory or cardiac problems, they may benefit from oxygen therapy for 10-15 minutes after using Entonox	To prevent post administration hypoxia
To clean the equipment: • Depressurise the system • The external surfaces of the demand valve must be cleaned with an alcohol-impregnated wipe. • If any contamination is suspected between the hose connection & the demand valve it must be sent to HSDU to be autoclaved. • Single use face equipment must be discarded - Filters are for single patient use and must be discarded. They may be kept by the patient's bed if they are going to use Entonox again within the next 24hours • The external surfaces of the administration set must be cleaned with an alcohol-impregnated wipe	To maintain a safe environment To minimise the risk of cross infection
Document details of Entonox administration, how effective it was & any side effects experienced by the patient	To provide an accurate record of efficacy and total duration received by the patient
Entonox cylinders should be kept in a secure environment, attached to a wall or trolley and away from patients when not in use	To maintain safe environment & to ensure equipment is in good working order
If the Entonox is used infrequently the cylinder should be checked weekly and its contents recorded. The expiry date should also be checked (Entonox has a 3-year shelf-life from date of fill).	To maintain a safe environment To ensure equipment is kept in good working order

Appendix 17- Abbreviations

AAGBI	Association of Anaesthetists of Great Britain and Ireland
ANTT	Aseptic non-touch technique
APS	Acute Pain Service
APTT	Activated Partial Thromboplastin Time
BMI	Body Mass Index
CEPOD	Confidential Enquiry into Peri-operative Deaths
CNS	Central Nervous System
COAG	Coagulation Profile
CT	Computed Tomography Scan
CXR	Chest X-ray
DOACs	Direct Oral Anticoagulants
EU	Emergency Unit
FBC	Full Blood Count
IBW	Ideal Body Weight
IM	Intramuscular
INR	International Normalised Ration
IV	Intravenous
LA	Local Anaesthetic
LAT	Local Anaesthetic Toxicity
LMWH	Low Molecular Weight Heparin
M C &S	Microbiology, Culture and Sensitivity
MST	Morphine Sustained release Tablet
MTC	Major Trauma Network

NBM	Nil By Mouth
NCA	Nurse Controlled Analgesia
NMDA	N- Methyl-D-Aspartate
NRFIT	Neuraxial Connectors
NSAID	Non-Steroidal Anti-Inflammatory Drug
PACU	Post Anaesthetic Care Unit
PCA	Patient Controlled Analgesia
PCEA	Patient Controlled Epidural Analgesia
PO	Per Oral
PDPH	Post Dural Puncture Headache
PONV	Post -Operative Nausea and Vomiting
PRN	As Required
SC	Subcutaneous
WHO	World Health Organisation
TTH	To Take Home