Acute Pain Management

Self Directed Learning Package
Acute Pain Management Learning Package (February 2013)

Acknowledgements

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CLINICAL GUIDELINE STATEMENT

Aim:

This learning package has been developed to assist nurses in achieving competency in the care and management of the following analgesic infusions

- Patient Controlled Analgesic (PCA)
- Ketamine
- Opioid

Objectives:

Upon successfully completing this learning package and accompanying competency the Registered Nurse (RN) and suitably Endorsed Enrolled Nurse (EEN) should be able to:

- Provide an outline of pain pathophysiology
- Identify and utilise appropriate techniques/tools to undertake a pain assessment
- Discuss and demonstrate knowledge of multi-modal pain management, utilising the WHO analgesic ladder as a point of reference.
- Understanding of how a PCA works
- State the pharmaceutical knowledge for specific medications
- Undertake the required Nursing Observations
- Identify interventions
- Management of complications
- Appropriate education of a patient
- Appropriate documentation

Scope of practice & clinical protocols - it is your responsibility to ensure you are familiar with the following:

- Acute Pain Management Protocol
- Medication Disposal Protocol
- Medication Administration Protocol

In order to achieve competence the Nurse must:

1. Complete the learning package
2. Participate in a tutorial with CNE/CNS/ANUM/CNF to develop an understanding of the PCA pump utilised within your clinical area.
3. Successful complete the practical PCA competency
Overview of Pain:

Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (International Association for the Study of Pain). This means that pain is what the patient says it is and it is real. This does not mean that patients are not in pain unless they complain of pain.

There are two main types of pain:

1. **Nociceptive Pain** – Pain which is initiated by nociceptors that are activated by noxious insults to peripheral tissues, maybe thermal, chemical or mechanical in nature. The term nociception means “pain sense” and describes the transmission of noxious stimuli via peripherally located nociceptors to the spinal cord and then to the thalamus where it is perceived as painful. Nociception involves the four physiological processes:
   a. **Transduction** - excitement of nociceptors triggering release of biochemical mediators that sensitise the nociceptors)
   b. **Transmission** - involves three stages the 1st is the pain sensation travelling from the peripheral nerve fibres to the spinal cord. The 2nd involves the transfer of the sensation from the spinal cord to the brain stem and thalamus. The 3rd entails the transmission of signals between the thalamus to the somatic sensory cortex where pain perception occurs.
   c. **Perception** - occurs when the patient becomes conscious of the pain). In many instances pain acts as a protective system, warning of contact with potentially damaging stimuli.
   d. **Modulation** - when the neurons in the thalamus and brain stem send signals back down to the dorsal horn of the spinal cord.
2. **Neuropathic Pain** – is pain initiated or caused by a lesion or dysfunction in the nervous system. Neuropathic pain results from damage to the nerve which leads to ‘faulty’ pain signals continuing to be sent when there is no longer a stimulus. This is most clearly demonstrated in the amputee patient where pain continues to be felt despite removal of the limb (phantom limb pain). Other causes of neuropathic pain include:

- Diabetic neuropathy – where nerves are damaged as a result of the disease process
- Postherpetic neuralgia – follows shingles and results in prolonged pain
- Trigeminal neuralgia – pain resulting from pressure to the nerves in the face
- Spinal cord injury
- Diseases affecting the nerves – cancer, multiple sclerosis
- Cardiovascular accident (CVA)
- Surgery (limb amputation, chest or abdominal operations)
Neuropathic pain is characteristic in nature with the patient describing it as:
- Squeezing
- Jabbing
- Broken glass
- Electricity
- Deep aching
- Cramping
- Like sunburn
- Spasms
- Extreme cold
- Like ants walking on the skin

Pain is further classified by how long it lasts:

**Acute Pain** (short term) is summarised “as well defined pain lasting less than three months and accompanied by physiological signs that respond to analgesic therapy and treatment of the underlying cause of the pain”.

**Chronic Pain** (long term) is defined as “pain lasting longer than three months, associated with a chronic pathological process and is often difficult to treat. Chronic pain often results in significant changes in personality, life-style and functionality”.

Pain may further be classified according to location/cause/frequency:

**Recurrent episodes of acute pain**: these are typically episodic bouts of acute pain which have a predictable end each time. i.e. Migraine headaches, menstrual pain.

**Malignant or Cancer pain**: related to malignant (often life threatening) causes, may be experienced daily and will end with either cure or death. Maybe both nocioceptive and neuropathic in nature.

**Non-Malignant Pain**: this pain is chronic, experienced almost daily, may continue for the remainder of the patients life and is due to non life threatening causes. i.e. back pain.

**Somatic Pain**: refers to the skin, bones, periosteum, tendons, fasica, muscles and connective tissue. The table below summaries characteristics of somatic pain according to the tissue injured:

<table>
<thead>
<tr>
<th>Pain Origin</th>
<th>Pain Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>Sharp and well localised</td>
</tr>
<tr>
<td>Periosteal</td>
<td>Sharp, severe and well defined and localised to a specific spot.</td>
</tr>
<tr>
<td>Muscle</td>
<td>Less sharp, intense and not well defined.</td>
</tr>
</tbody>
</table>
Visceral Pain: originates in the internal organs (bladder, intestine, gallbladder, urethra, heart). These organs are less responsive to cutting, heat or pinching but very sensitive to twisting and distension. Acute visceral pain is described as intense, dull, aching pain that is not well localised.

Referred Pain: is perceived in one part of the body with the actual pain originating in an entirely different area or tissue.

Breakthrough pain: maybe referred to as incident pain. This is an exacerbation of acute pain on top of well controlled pain.

### Knowledge Check 1:

1) Differentiate between acute and chronic pain

2) Which of the following are in the correct order:
   a. Transmission, modulation, perception, transduction
   b. Modulation, perception, transmission, transduction
   c. Transduction, transmission, modulation, perception
   d. Perception, transduction, transmission, modulation

3) A patient who has undergone a total hip replacement is experiencing what type of pain?

4) List four causes along with four descriptors of neuropathic pain.
WHAT SHOULD BE ASSESSED?

- The location, duration, intensity and characteristics of the pain

As pain is a subjective experience, and what the patient says it is verbal report is the most valuable tool when assessing a patient’s pain and their pain experience. The following acronym is useful in assessing the characteristics of the pain

**PQRSTU**

- **P** Pain Site & Precipitating Factors- what causes/d the pain (eating/drinking, deep breathing and coughing, exercise)
- **Q** Quality- describe the pain, what does it feel like (‘sharp’, ‘heavy’, ‘throbbing’ ‘dull’, ‘intermittent’ or ‘continuous’), is it worse when you breath in/out.
- **R** Radiation- can you feel the pain anywhere else?
- **S** Severity- Rate the pain utilising one of the tools on the following page.
- **T** Timing- have you had it before, does it come at a particular time, how long have you had it & what relieves the pain.
- **U** What happened to U and what it means to U? (Pain creates fear, anxiety and a sense of loss of control.)

It is also useful to consider the following points:

- **The underlying condition.**

The underlying cause of a patient’s pain is central in determining whether the treatment is curative or palliative.

- **Is the pain acute, chronic or acute on chronic?**

This will influence the choice of treatment.

- **Related symptoms**

E.g. Nausea, vomiting, sleeplessness can cause the patient distress and interfere with the patient’s ability to cope with pain.

- **Coping Strategies used by the patient- pharmacological and non-pharmacological**

Consider how the patient has coped in the past with pain. Use of heat/cold packs, massage and distraction techniques should be investigated.
MEASURES OF PAIN

There are a number of self-reporting pain scales that are available that measure either pain intensity or the degree of pain relief following an intervention.

Visual Analogue Scale

The Visual Analogue Scale (VAS) allows the patient to rate their pain intensity using a 10 cm line with one end-point indicating ‘no pain’ and the other indicating ‘worst imaginable pain’.

![Visual Analogue Scale](image)

Verbal Numerical Scale (VNS)

The Verbal Numerical Scale is similar to the VAS. Using a scale of 0 to 10 where 0 represents ‘no pain’ and 10 represent ‘worst pain imaginable’; patients are asked to indicate the number that best represents their pain. Some patients will find this difficult and may find the visual scale easier.

Face Rating Scale

The faces pain scale (FPS) was first developed by Wong and Baker and is recommended for those aged 3 and older. An explanation is given to the patient that each face is a person who feels happy because he has no pain or sad because he has some or a lot of pain. The patient is then asked to choose the face that best describes how they feel. There may be six or seven faces in the scale. The FPS is also useful in adults, especially the elderly or those who are cognitively impaired.

![Wong Baker Face Scale](image)
These scales are simple and quick to use and provide consistent results of pain intensity. Providing the patient is able to understand the tool, regular use provides evidence of the efficacy of management regimens and indicates an improvement or worsening of the patient’s pain experience. Alternative pain measurement scales such as the behavioural rating scale below must be considered for patients who have difficulty communicating their pain (e.g., cognitively impaired patients, children under 5 years) as do patients whose language or cultural background differs significantly from that of the health care team. Pain assessments should be done prior to activity and then following the activity. This will give the nurse an accurate measurement of the patient’s overall pain status. You need to also consider the impact of pain on the patient’s ability to function. This includes: undertaking active and passive movement, deep breathing and coughing, ability to change position and ability to carry out activities of daily living.

* Assess muscle tone in patients with spinal cord lesion or injury at a level above the lesion injury. Assess patients with hemiplegia on the unaffected side.

** This item cannot be measured in patients with artificial airways.
Pain Management Interventions

Pain relief interventions can be divided into two main classifications:

- **Pharmacological**
- **Non-Pharmacological**

The intention is to block the transmission of pain peripherally (nociceptors and nerves), centrally (spinal cord and brain) or both.

There are three main classifications of analgesics

1. **Non Opioids**: Simple analgesics (e.g. paracetamol) and Non steroidal anti-inflammatory Drugs (NSAID’s- e.g. diclofenac, celebrex)

2. **Opioids**: predominantly act on the CNS: binding with specialised receptor sites in the brain, spinal cord and periphery.

3. **Adjuvant**: As patients often experiencing different kinds of pain (ie pre-existing chronic pain) combination drug therapies may lead to greater pain control by acting on more than one part of the nociception pathway

Knowledge Check 2:

1) You are caring for Mr Hill an 80 year old admitted for back pain. Mr Hill informs you he has pain. Outline the process you will utilise to assess his pain:

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

Version 2.2
The World Health Organisation (WHO) recommends a simple three-step “ladder” to guide a health care professional’s decision making in treating pain. The diagram below summarises the steps undertaken to achieve a state of “no pain” for the patient.
Knowledge Check 3:

1) The information elicited from your pain assessment of MR Hill included that it has become worse following his physiotherapy session, it is a sharp spasm, which radiates down the posterior of his left leg, and he is quite distressed about the reoccurrence of the pain and is anxious about what this means in the future. Utilising the VNS MR Hill rates his pain as a 6/10 at rest and 8/10 upon movement. As the nurse caring for MR Hill how would you manage his pain?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________
What is Patient Controlled Analgesia (PCA)?

The concept of a PCA involves an opioid loaded syringe or flask, which delivers incremented doses to the patient on demand. A PCA permits a patient to be in control of their own pain experience by self-administering doses of analgesics. With the aid of a computerised pump small amounts can be self administered by the patient by simply pressing the button provided. This approach recognises that only the patient can feel the pain and only the patient knows how much analgesic will relieve it. This is why a thorough pain assessment is essential as pain is purely a subjective and individualised experience. The PCA removes an observer’s interpretation of the amount of analgesia the patient may need to receive. The overall goal of this method of analgesia is to provide maximum analgesia in combination with minimal sedation and other potential side effects.

INDICATIONS FOR USE OF PCA

- Post operative pain relief.
- Acute pain management for conditions such as acute pancreatitis.
- Chronic pain management in some patients, more specifically in the home care situation.
- Acute trauma (fractures, severe soft tissue injuries)

CONTRAINDICATIONS FOR USE OF PCA

- A patient who does not comprehend and understand the basic concept of PCA, i.e. that they must press the button when they feel discomfort
  - Very elderly or confused patients.
  - Intellectually disabled
  - Young children (Epworth HealthCare protocol indicates children under 7 are contraindicated)
- If someone is physically unable to hold and use the hand held button.
- Nursing personnel untrained in the use of PCA
The PCA Theory

Opioids must reach certain concentrations in the blood to be effective. The right dose is based initially on patient age and adjusted by increments. Amounts required can decrease with age due to slower metabolism within the body. This means that the doses must be individually titrated for each patient. The lowest blood concentration that will produce analgesia is termed the *minimum effective analgesic concentration* (MEAC). Anything below this level will mean that the patient will still experience pain and above it there will be increasing analgesia (and an increasing chance of side effects). The range of blood levels where analgesia is achieved without significant side effects is referred to as the ‘analgesic corridor’. The aim of effective analgesia is therefore to find and maintain the effective blood concentration within this ‘corridor’ (See diagram below).

![Diagram of analgesic corridor]

Traditional post operative analgesia comprised of the administration of PRN (as required) intramuscular or subcutaneous injections of opioids. This led to inadequate pain management due to the following reasons:

- Inadequate doses
- Pain from the administration of needles
- Time delays from the time patient requests to the time the nurse delivers
- Time delays due to the specific pharmacological properties of the drugs
- Often long intervals between ‘allowed’ doses

As a result the patient experiences peaks and trough effect as they transit between pain, the analgesic corridor and side effects, as highlighted by the black line in the diagram.
Whereas the blue line highlights the action of the PCA removing the aforementioned barriers to optimal pain relief and resulting in good analgesic control and avoiding both pain and side effects.

Knowledge Check 4:

1) List five advantages of a PCA compared to traditional pain relief administration methods:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
## COMMONLY USED DRUGS

<table>
<thead>
<tr>
<th>Drug</th>
<th>Action Onset</th>
<th>PCA Standard Concentration</th>
</tr>
</thead>
</table>
| Morphine | **Intravenous:** 1-2 minutes, peak effect 3-6 minutes duration 4 hours  
Note: When metabolised morphine causes sedation and analgesia. Antagonist= naloxone | 1mg/ml                     |
| Pethidine | **Intravenous:** 1 minute onset, duration 2-4 hours  
Note: pethidine has a half life of 3-4 hours, however is metabolised into norpethidine in liver which may cause CNS excitation resulting in twitching, convulsion and death. Norpethidine has a half life of 15-24 hours. Seizures induced by norpethidine do not respond to the administration of antagonist such as naloxone. | 10mg/ml                    |
| Fentanyl | **Intravenous:** 1 minute, peak effect within several minutes, duration up to 30-60 minutes. Note: After intravenous injection, serum concentrations of fentanyl have been shown to decrease rapidly to about 20% of peak concentrations within five minutes of injection. Antagonist= naloxone | 100 mcg/10ml               |
| Ketamine | **Intravenous:** Peak effect of action 5-10 mins. Half life 3-6 hours. For pain relief Ketamine infusions are often commenced between 0.1-0.25mg/kg/hr. This is then titrated until the desired effect is achieved without the presence of adverse effects (Macintyre & Schug, 2007).  
Note: Ketamine has no antagonist agent, therefore side effects need to be monitored and reported in a timely manner to the prescribing doctor. If used concurrently with barbiturates and opiates the effects of Ketamine are increased. Monitor the patient’s alertness and orientation closely. Respiratory depression is not associated with Ketamine administration however sedation is much more likely to occur. | 1-4mg/ml  
(50-200mg in 50mls) |

### Opioid Analgesics:

**General actions of opioids** – agonistic action on opioid receptors; depresses respiratory and cough centres; stimulates vomiting centre and vagus nerve; increases GIT smooth muscle tone; reduces peristalsis and secretions; relieves anxiety; produce euphoria or dysphoria; drowsiness.

**Adverse effects** – nausea; anorexia; constipation; vomiting; urinary retention; anti-diuretic effect; ureteric or biliary spasm; decreased visual acuity; cough depression; drowsiness; euphoria; dysphoria; confusion; sweating; vertigo; sedation; restlessness; mood change’ bradycardia; orthostatic hypotension; facial flushing; bronchospasm; urticaria and pruritus; dependence; respiratory depression; hypotension; circulatory failure; coma; convulsions; tolerance; impaired sexual function (Tiziani, 2010).
**Ketamine** *(note there is no reversal agent for Ketamine)*

**Action:** is a unique short-acting general anaesthetic agent with potent analgesic properties. It is particularly useful in patients with opioid tolerance. Benefits of Ketamine include reduced opioid requirements and facilitation of bronchodilation. Also encourages bronchodilation. Ketamine is metabolised by the liver and excreted by the kidneys, therefore in patients with known impairment greater vigilance is needed monitoring of patients for adverse effects. Contraindicated in patients with a raised intra-cranial pressure (ICP).

**Adverse effects - CNS:** dissociative state, vivid dreams, unpleasant dreams, floating sensation, hallucinations, confusion, agitation, shivering; involuntary muscle movement, nystagmus, increased muscle tone, increased intra-cranial pressure. **CVS & Respiratory:** In approximately 25% of patients an increase in base line blood pressure and heart rate may occur. Hypotension, bradycardia, bronchospasm, bronchodilation, cardiac arrhythmias; apnoea, anaphylaxis, coughing. **GIT:** hypersalivation and hiccups. (Tiziani, 2010; MIMs Online, 2012). For the average sized adult patient (70kg) does of less than 200mg in 24 hours are unlikely to cause side effects, and in some cases up to 300mg in 24 hours may be utilised without leading to adverse effects. However, in elderly patients as little as 50mg in 24 hours may lead the patient to develop side effects due to the reduced function of the liver and kidneys.

*Note: If tonic and clonic movements resembling seizures are present this is not an indication for increasing the rate and medical assistance should be sought immediately as per MET/Code blue criteria.*
Knowledge Check 5:

1) Complete the following table:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Peak Effect (IV)</th>
<th>Side Effects</th>
<th>Prescription Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Twitching and convulsions</td>
<td>1mg/ml</td>
</tr>
<tr>
<td>Fentanyl</td>
<td></td>
<td>Dissociative state, seizure activity, bronchospasm, hallucinations, irrational behaviour, hypersalivation.</td>
<td>100mcg/10mls</td>
</tr>
</tbody>
</table>

2) Why is it vital that you monitor and observe patients receiving Ketamine very closely? What in particular do you need to report to the prescribing consultant promptly?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Key terminology relating to a PCA:

**PCA dose:** Also referred to as the bolus dose, is the amount of opioid received by the patient following each successful demand.

**Loading dose:** Commonly utilized in the commencement phase (in the Post Anaesthetic Care (PACU) or Intensive Care (ICU) units, where immediate management of severe pain is required). This function allows for the rapid titration of analgesia by the administration of extra doses on top of the prescription order.

**Lockout interval:** This is the time in minutes following successful delivery of a dose where the pump will not administer further doses, even if the patient demands further analgesia. It is usually set at 5 – 10 minutes, depending on the order, the condition of the patient and individual analgesic requirements.

**Background infusion:** This is a continuous infusion that can be added to the PCA or used alone. It has the following advantages:

- achieves more steady blood concentrations of the opioid
- improved analgesia during sleep because the patient does not have to be awake to press the demand button

**4 hour dose limit:** An optional feature of the PCA machine where the doctor may order an amount of opioid not to be exceeded in a four-hour period. This feature is not commonly utilised due to large variations in individual dose requirements.

**Intravenous and PCA analgesia maybe delivered in three ways:**

1. **Bolus demand dose systems (PCA only)** – patient activates the system by pressing the button when they feel it is necessary. A predetermined (by anaesthetist) dose of analgesia is delivered. After this a lockout time persists, usually for a period of 5 minutes.

2. **Bolus demand and continuous infusion systems (PCA and continuous)** – there is a constant infusion being delivered to the patient and also the patient can demand doses at any time. The continuous infusion allows for a stable background of plasma opioid concentration
3. Continuous infusions only - the patient receives a continuous amount of opioid and therefore has no control. However the nurse may titrate the dose within the parameters prescribed on the MR 81 (Analgesic Infusion Chart) based upon the presence of pain or side effects. Ketamine is often administered via a continuous infusion.

**PRESCRIPTION REQUIREMENTS:**

Drug orders for PCAs/continuous infusions are completed by a medical officer, most commonly the anaesthetist. If any problems occur then the prescribing medical officer should be contacted.

For all PCAs/ Infusion orders to be valid it needs to have:

- Patient Name, DOB and UR number.
- Patients allergies noted
- Name of the drug and Dose
- Dilution solution
- Final Volume
- Final Concentration

**FOR Continuous infusions (no PCA option)**

- Infusion Range
- Commencement Rate
- Commencement Time

For PCAs

- Drug concentration,
- Loading Dose
- Mode
- PCA dose
- Lockout interval

- Duration of time order valid for.
- Reportable levels
- Standing orders
- Prescribing Doctors signature
- Doctor contact details.

- Bolus Volume, Frequency and maximum number

- Continuous Rate
- 4-hr dose limit
- 2nd and subsequent syringe orders
### Knowledge Check 6:

1) Using the charts over the page identify the following details:
   
   a. PCA dose: ________________________________________________
   
   b. Final Concentration: _______________________________________
   
   c. Loading dose: _____________________________________________
   
   d. Mode: ___________________________________________________
   
   e. 4 hour dose limit: _________________________________________
   
   f. Lockout interval: __________________________________________
   
   g. Continuous rate: __________________________________________
   
   h. How long is the order valid for: _____________________________
   
   i. What are the reportable levels: ______________________________
      __________________________________________________________
      __________________________________________________________
   
   j. What are the standing orders: _______________________________
Mandatory Safety Requirements for the patient with PCA or Opioid/Ketamine Infusion:

- The ketamine/opioid infusions/PCAs need to be infused through a device with a “locked” control panel and in which the syringe/flask are accessible only via key (i.e. Baxter I-pump or Alaris IVAC/PCAM).

- Resuscitation equipment, including oxygen and suction must be readily available and in working order. It is important that you know where these are located and how to prepare/utilise each of these prior to accepting a patient with a PCA or analgesic infusion.

- An ampoule of NALOXONE 0.4mg must be readily available. A standing order for dose and administration must be documented by the treating anaesthetist/surgeon.

- PCAs Ketamine/Opioid infusions should be infused either through its own dedicated IV or via the most proximal port of a carrier infusion.

- Portless IV connection tubing should be used to avoid inadvertent dosing/bolusing.

- An anti-reflux valve must be incorporated into all PCA/Opioid/Ketamine infusion sets to prevent the migration of other infusions (drugs & Fluids) into the PCA line.

- Ensure that there are adequate Intravenous orders to keep the patient’s vein open whilst they are receiving therapy via a PCA/opioid or Ketamine infusion.

- The patient is the only one to press the button. This is because the early signs of opioid induced respiratory depression are sedation and a sedated patient cannot press the button, resulting in a fall in the blood concentrations of the opioid falling and the patient returning to an awake state. Signs should be attached to the machine making all personnel including visitors aware that only the patient is to push the button.

- In line with the national medication labelling guidelines a drug additive label must be attached to the PCA/opioid/Ketamine infusion line/system where it is easily visible to health care professionals.
- No other opioids (subcutaneous, I/M, IV, rectal or oral) are to be administered whilst the patient is receiving opioids via the PCA as this will increase the risk of respiratory depression without consultation and approval from the treating anaesthetist.

- No other sedating agents are to be administered whilst you patient are receiving opioids/Ketamine via a PCA or continuous infusion as this may again potentially increase the risk of respiratory depression (ie benzodiazepines).

- The PCA/Opioid/Ketamine infusion is double checked against the prescription by in accordance to the Epworth HealthCare Medication Administration protocol and Epworth Clinical Handover policy at the following times:
  - On the patient’s RTW
  - At shift handover
  - Upon transferring to other departments
  - When changes are made to the settings
  - When the syringe/flask are replaced

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**Observe high risk patients closely: the elderly, the obese and those with sleep apnoea.**

**Administration of a bolus dose (excluding PCA doses) will lead to a spike in the plasma levels and hence the sudden onset of side effects. Therefore, patients need an increase in the frequency of observations immediately following the bolus administration (See page 29 for frequency).**
NURSING OBSERVATIONS

The following observations are required for a patient using PCA or opioid/ketamine infusion.

**Pain:** Utilising appropriate assessment tool.

**Sedation:** An increase in the patient’s level of sedation is the most reliable early sign of respiratory depression as a patient may be sedated but have a normal respiratory rate. All patients receiving opioid or sedative agents must have their sedation level assessed hourly for the first 24 hours to:

- Ensure patient safety by identifying excessive sedation or lowered respiratory rate
- Identify when analgesia strategies may need to be modified as a result of changing sedation or respiratory levels
- Allow the patient to function and cooperate with rehabilitation activities.

The sedation score measures the patient’s level of wakefulness and their ability to respond appropriately to verbal command. It is a four-point scale using the criteria listed below.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Awake, alert</td>
<td>The patient is awake, alert and responds appropriately to verbal command.</td>
</tr>
<tr>
<td>1</td>
<td>Easily rousable to voice</td>
<td><strong>Mild sedation</strong>- The patient rouses easily from sleep/rest, is able to stay awake and is alert and cooperative.</td>
</tr>
<tr>
<td>2</td>
<td>Difficult to Rouse</td>
<td><strong>Moderate sedation, unable to remain awake:</strong> The patient is frequently asleep or drowsy when observed. The patient is drowsy on waking, able to follow commands but unable to remain awake.</td>
</tr>
<tr>
<td>3</td>
<td>Unrrousable</td>
<td>The patient is difficult to rouse or unrrousable. The patient has difficulty with following commands or is unable to follow commands.</td>
</tr>
</tbody>
</table>
Respiratory: Need to monitor the patient’s respiratory rate depth, effort and oxygen saturation. These are secondary markers for respiratory depression as they are late signs. Note Ketamine does not cause respiratory depression.

Heart Rate
Blood Pressure
IV insertion site
Nausea & Vomiting
For Ketamine see page 32 for additional CNS disturbances which must be assessed in addition to the above mentioned observations.

Frequency of Observations

- Attended at the commencement of PCA/opioid/ketamine infusion or upon return to ward, after change of program / dose/ rate or change of nursing shift during clinical bed side handover.
- Observations are taken half hourly for the first 4 hours, then hourly for the next 8 hours provided the patient is stable, and 2 hourly thereafter.
- For the first 24 hours following commencement of the PCA/opioid/ketamine infusion sedation score, amount of medication and cumulative total should be documented hourly.
- The dosage record is documented on the PCA infusion observation chart (MR81).

It is much better to wake the patient briefly, if you are concerned, then leave them in a sedated state.

Following a bolus dose for patients receiving a continuous infusion (opioid or Ketamine) the following observations must be attended

- 5 minutely for 20 minutes and if patient stable, no side effects are present and pain is relieved return to previous observation regime
- Assess pain, sedation score, blood pressure, respiratory rate and depth
- For continuous opioid infusions it is preferable to have continuous oxygen saturation monitor in use, throughout its duration.
- Also consider an increase in the infusion rate within the prescribed parameters.
DOCUMENTATION

Documentation required includes the analgesic infusion form- MR81, the observation chart MR26 and any adverse effects on the MR12. Remember if it is not documented it is considered not done. When observations are undertaken the following must be checked and documented hourly:

- Demands for bolus made by the patient (only applicable to a PCA)
- Dose of drug delivered in milligrams or micrograms as appropriate
- Cumulative total of milligrams or micrograms delivered
- Sedation score

The following should be documented in accordance to the aforementioned observation requirements:

- Pain, B/P, Heart rate, Oxygen saturations, Respiratory Rate and depth

All adjustments to PCA order, changes in analgesic infusion rates and additional bolus doses should be signed witnessed and signed for by two Registered Nurses or a Registered Nurse and a suitable endorsed Enrolled Nurse (IV route) who has been deemed competent in management of a PCA/Opioid/Ketamine infusion in the appropriate sections on the analgesic infusion chart (MR80). Note a valid doctor’s order must be obtained prior to any changes being made.

See below for examples of dose documentation.

For a PCA of Morphine 1mg/ml with a 1ml bolus dose.

<table>
<thead>
<tr>
<th>PCA</th>
<th>Demands / hr</th>
<th>Delivered / hr</th>
<th>Progressive Total mg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 3 4 2 5</td>
<td>1 2 3 2 4</td>
<td>1 3 6 8 12</td>
</tr>
</tbody>
</table>
For a pethidine infusion of 10mg/hr, range of 10-20mg.

<table>
<thead>
<tr>
<th>Infusion rate ml/hr / mg/hr</th>
<th>10</th>
<th>10</th>
<th>10</th>
<th>15</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cumulative dose</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>45</td>
<td>60</td>
</tr>
</tbody>
</table>

Knowledge CHECK 7:

1. You receive clinical bedside handover at 1400 hours for Mrs Smith who has had a Right Total Knee Replacement today. Mrs Smith RTW at 1200 hours and has a PCA of Morphine for pain insitu. During handover what checks need to be completed for a patient with a PCA?

2. You are planning your shifts care for Mrs Smith, what assessments and observations will you undertake and how often?

3. Mrs Smith requests a Tamazepam to help her sleep at night time, when is this ok and who needs to prescribe the medication?

4. For patients receiving a continuous opioid infusion what must be documented and when are additional patient observations required?
## POTENTIAL COMPLICATIONS

<table>
<thead>
<tr>
<th>Complication &amp; Causes</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sedation</strong></td>
<td>• STOP Infusion if sedation score = 2-3.</td>
</tr>
<tr>
<td></td>
<td>• Initiate MET/ code blue criteria if met.</td>
</tr>
<tr>
<td></td>
<td>• Apply 8-10 L of oxygen via Hudson mask.</td>
</tr>
<tr>
<td></td>
<td>• Encourage patient to breath</td>
</tr>
<tr>
<td></td>
<td>• Administer Naloxone as ordered.</td>
</tr>
<tr>
<td></td>
<td>• Reducing the PCA dose, infusion rate or turning off any background infusion is usually the best line of treatment.</td>
</tr>
<tr>
<td><strong>Respiratory Depression</strong></td>
<td>• A sedation score &gt; or = 2 and a respiratory rate &lt; 8 must be reported to a medical officer/anaesthetist.</td>
</tr>
<tr>
<td></td>
<td>• Initiate MET/ code blue criteria if met.</td>
</tr>
<tr>
<td></td>
<td>• STOP infusion</td>
</tr>
<tr>
<td></td>
<td>• Ensure airway is not obstructed</td>
</tr>
<tr>
<td></td>
<td>• Apply 6 L/min oxygen via Hudson mask.</td>
</tr>
<tr>
<td></td>
<td>• When you are observing someone’s respiratory rate also assess the Depth of respiration.</td>
</tr>
<tr>
<td></td>
<td>• Shallow breathing (hypoventilation) is just as significant as a low respiratory rate</td>
</tr>
<tr>
<td></td>
<td>• Consider oxygen saturations as well.</td>
</tr>
<tr>
<td></td>
<td>• Administer Naloxone (0.1mg IVI at 1-2 min intervals prn or as ordered.</td>
</tr>
<tr>
<td><strong>Central Nervous System Disturbances (Specific to Ketamine infusions)</strong></td>
<td>• Assess for signs of sedation, report sedation scores &gt; or = 2 to a medical officer or anaesthetist.</td>
</tr>
<tr>
<td></td>
<td>• Initiate MET/Code blue criteria if met.</td>
</tr>
<tr>
<td></td>
<td>• Ensure airway is maintained +/- managed</td>
</tr>
<tr>
<td></td>
<td>• Consider application of oxygen</td>
</tr>
<tr>
<td></td>
<td>• Monitor orientation, alertness and nystagamus-report changes to prescribing medical officer.</td>
</tr>
<tr>
<td></td>
<td>• Observe for signs of dysphoria and hallucinations, and vivid dreams, these are often very distressing to the patient, therefore consider a quite, low stimulus environment (low lights and activity). Ensure prescribing doctor is informed.</td>
</tr>
<tr>
<td></td>
<td>• Decrease infusion rate when any side effects</td>
</tr>
</tbody>
</table>

- Excessive sedation is the best early warning sign of opioid induced respiratory depression.
- Most patients will experience sedation at the beginning of opioid therapy.
- It is important not to confuse sedation with exhaustion and the need to “catch up” on sleep when poorly controlled pain is finally controlled.

- Respiratory rate should always be considered with a sedation score. Optimal aim is a sedation score of 0 or 1 with a RR greater than 10.
- Keep in mind that an increasing sedation score is the earliest sign of respiratory depression, as a change in respiratory rate is a late sign.

- Ketamine has no antagonist agent, therefore side effects need to be monitored and reported in a timely manner to the prescribing doctor.
- If used concurrently with barbiturates and opiates the effects of Ketamine are increased. Monitor the patient’s sedation, alertness and orientation closely.
- Increased sedation is a major side effect of Ketamine.
- Tonic and Clonic seizures may develop
<table>
<thead>
<tr>
<th>Hypotension</th>
<th>Nausea &amp; Vomiting</th>
<th>Urinary Retention</th>
</tr>
</thead>
</table>
| Induced by the release of histamine  
Also may be induced by the depression of the medulla affecting the vasomotor centre, resulting in vasodilatation | Beware of ACE/MET criteria and PCA reportable levels.  
STOP infusion  
Lie patient flat +/- raising legs or tilting the bed if not contraindicated.  
Apply oxygen 6L/min by mask  
Check standing orders  
Possible orders include fluid bolus, volume expanders, blood products. Note in line with Epworth Protocol Metaraminol or Ephedrine must be administered by a medical practitioner (see page 35)  
Encourage oral fluid intake if patient able.  
Inform anaesthetist | Check patient has passed urine within previous 4-6 hours.  
Perform Bladder scan.  
If bladder amount greater than 500 mls and the patient is uncomfortable, cannot urinate or is experiencing dysuria notify medical staff as an indwelling catheter may need to be inserted.  
If bladder scan indicates minimal urine within bladder consider other causes, complete full patient assessment and notify anaesthetist/treating consultant as required. Be aware of MET/Code blue criteria and initiate accordingly. |
| Maintain patient safety and that of others (include patients/visitors/ staff)  
Offer reassurance ++++  
Contact anaesthetist | Caused by many conditions including intra-abdominal pathology or surgery, visceral pain (renal or biliary), neurological events, hypotension and psychological factors.  
Opioids are associated with increased incidence of this side effect | Can occur with opioid analgesia. Opioids increase smooth muscle tone in the bladder and urethras and can cause bladder spasm and urgency. An increase in sphincter tone can make urination difficult.  
Consider other reasons for decreased or absent urine output, hypovolemia, blood loss, dehydration, acute renal failure or inadequate cardiac output |  
Most are treated with anti emetics  
Any nausea and vomiting not responding to prescribed treatment must be reported to the anaesthetist.  
May benefit from a lower dose of opioids if ordered.  
Dry ginger ale and sports drinks maybe helpful to some patients if able to tolerate. |
### Pruiritis
- Or itching is a side effect that can occur in some pts as a result of activation of opioid receptors in the spinal cord. Rare in opioid infusions.
- Notify anaesthetist. Reassurance and explanation of reason may allow for tolerance
- Consider decreasing opioid dose, use of anti histamines or low dose naloxone.

### Paralytic ileus and constipation
- Opioids can delay gastric emptying, slow bowel motility and decrease peristalsis
- Opioids may also reduce secretion from the colonic mucosa which results in slow moving, hard stools which are difficult to pass
- At worst GI dysfunction can result in ileus, faecal impaction and obstruction
- Constipation is the most common opioid side effect and the only one for which patients will not develop a tolerance to.
- Encourage high fibre dietary choices such as prunes, wholegrain breads, bran, fruits and vegetables.
- Regular oral aperients (depending on patient condition/ surgery and medical staff care preferences) should be given proactively to Prevent constipation.
- Abdominal assessment- observe for distension, Discomfort, tenderness and firmness on palpation. Auscultation of Bowel sounds.

### Diaphoresis
- Can occur occasionally but will usually settle down without treatment
- Observe for a sweat rash- a cotton blanket under the sheet can help reduce the discomfort Experienced by a patient.

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**Knowledge Check 8:**

1. When undertaking Mrs Smith’s observations you find the following B/P 115/65, HR:92, Temp 36.7, RR=8, O2 Sats= 92%, sedation score of 2. What is the likely cause of these changes and what interventions would you implement?

---
Medications utilised to treat complications.

**Naloxone**

**Presentation** - 0.4mg/ml amp (400mcg/ml = 0.4 mg/ml)

**Actions** - reverses the effects of opioids, including respiratory depression and decreased sedation.

**Onset of action** - IV approx 2 minutes; IM/SC approx 3-5 minutes.

**Duration of action** - IV - 20-30 mins; IM/SC - 45-60 mins.

Half life: 30-80 minutes, with a mean of 60 minutes in adult patients.

**Adverse reactions** - abrupt reversal of opioid may cause nausea/vomiting, sweating, tachycardia, hypertension and tremors; pulmonary oedema, restlessness, seizures, cardiac arrest possible if administered too quickly. It is also worth remembering giving too much naloxone too quickly may reverse all the effects of pain relief and leave the patient in severe pain.

**Dosage** - 0.1-0.2mg IV at 1-2 minute intervals, depending on the response; may require further doses or infusion

**Administration** - Draw up 400 mcg (1 ml volume) of naloxone into a 5 ml syringe, Add 3 mls of normal saline 0.9% giving a final concentration of 100 mcg/ml Administer 1 ml (100 mcg) intravenously each minute until the patient responds as ordered.

---

Please be advised that an Intravenous dose of Metaraminol or Ephedrine can only be administered by a Medical Practitioner (who must observe and remain in attendance until patient is stable or transferred to high aquity area) is **NOT** to be administered by a nursing staff.

**Metaraminol**

**Action** – alpha-adrenergic stimulant effects resulting in increased blood pressure and cardiac output and peripheral vasoconstriction

**Use** - preventing and treating acute hypotension

**Dosage** - Dose usually 0.5mg-1mg (IV administration only).

**Administration** - IV bolus Metaraminol 10mg in 1mL. Dilution in 19ml Normal Saline = 20ml, giving a final concentration of 0.5 mg/ml. Therefore 1-2 mls per a bolus depending on the prescribed order. Nurses may assist in preparing the medication however may not administer.
**Ephedrine**

**Action** – direct and indirect sympathomimetic affects on both alpha and beta adrenoceptors

**Uses**
- Increases cardiac output and peripheral vasoconstriction
- CNS and respiratory centre stimulant
- Bronchodilatation
- Reduces intestinal tone and motility
- Relaxes bladder all and contracts the sphincter muscle

**Dosage** Dose usually 3-6mg (IV) or 15-30mg IM

**Administration:** *Intravenous*: Ephedrine sulphate ampoule contains 30mg in 1mL. Dilute in 9mL Normal Saline = 10mL volume and concentration of 3mls per/ml. Therefore 3-6mgs (1-2 mls) are administered as per anaesthetists order. *Intramuscular* doses are not diluted.

---

### Knowledge Check 9:

1. Complete the following table:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Indication</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respiratory Depression</td>
<td>30mg in 1 ml diluted in 9mls of normal saline= 3mls/ml. IM is administered</td>
</tr>
<tr>
<td></td>
<td>Sedation</td>
<td>undiluted</td>
</tr>
<tr>
<td>Metaraminol</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THE IMPORTANCE OF PATIENT EDUCATION

Studies on the effects of proper patient education have shown that patients receiving pre-op teaching recover more quickly, experience less post-surgical pain, have less psychological distress and are more satisfied with the care they receive.

Below is a checklist of important points to cover when educating your patient.

- Why a PCA is required
- What a PCA is.
- How a PCA works
- When they will have the PCA
- Where the PCA will be
- Identify the patients preferred method of pain assessment - it will be utilised post-operatively to assess their level of pain and the effectiveness of the PCA.
- Highlight the safety factors e.g. 5 minute lock out time, 4 hour dose limit, and the importance of keeping on top of the pain, keeping their pain score down to a comfortable level.
- Ask the patient to let the nurse know if they feel the PCA is not being effective despite use of the button.
- Ensure that they understand that they are in control of their pain, and are the only person who can press the button.
- If they start having any side effects such as pruritis, nausea and vomiting that they inform the nurse, rather that stop using the PCA.
- See appendix one for patient education form.

Remember an uneducated patient does not cope with a PCA and can in fact do more harm than good.
Things to remember when ceasing a PCA

- Ensure alternative analgesia is prescribed
- Adherence to hospital policy with regard to schedule 8 drug disposal and documentation
- Turn off the PCA and disconnect from patient
- Provide alternative form of analgesia as required / as per orders
- Educate and Inform pt to report further discomfort
- Monitor patient vital signs, pain score and sedation scores
- Record volume discarded in the MR41A and dispose under the supervision of another RN or medication endorsed EN (one must be an RN)
- Leave IVC in place for a minimum of 3 hours post removal to ensure side effects may be treated. You must also consider other treatments

What Next:
With a CNF/CNS/ANUM/CNE go through the following:

- Setting up a PCA
- Checking a PCA at Shift commencement (initial assessment)
- Refilling the PCA
- Discontinuing the PCA
- Documentation
- Recognition and management of side effects
- Ceasing PCA & Pt Care
- Compete theoretical competency assessment tool (Available from NUM, ANUM, CNF, CNE).
- Complete Practical Assessment- see Appendix 1.
- Scope of practice- until completed competency assessment tool inform ANUM / NUM if allocated a PCA.
References:


Epworth HealthCare (2012) Care of the Acute Patient with an Opioid or Ketamine Infusion (including PCA) Protocol


Ketamine (2012). Retrieved from Mims Online.


## Appendix 1:

**Practical Skill Competency**

<table>
<thead>
<tr>
<th>Utilising the example MR 81 demonstrate the following:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Prepare and Insert the flask/syringe correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ensure the previous patients history is erased</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Programme the pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Change a setting- program an additional continuous infusion or change PCA dose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Double Checking of PCA/opioid/ Ketamine Infusion (*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Change of shift checking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Required Documentation:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o RTW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Observations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Change to order</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Standing orders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Presence of side effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Ceasing of a PCA/opioid/ Ketamine infusion (*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*May be stated*