PATIENT CONTROLLED ANALGESIA
LEARNING PACKAGE
<table>
<thead>
<tr>
<th>Table of Contents</th>
<th>page#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Objectives</td>
<td>3</td>
</tr>
<tr>
<td>Concepts of Pain Relief</td>
<td>4</td>
</tr>
<tr>
<td>Introduction to PCA</td>
<td>4</td>
</tr>
<tr>
<td>Definition of terms used with IV PCA</td>
<td>6</td>
</tr>
<tr>
<td>Opioids used with IV PCA at NYGH</td>
<td>7</td>
</tr>
<tr>
<td>Patient Selection</td>
<td>9</td>
</tr>
<tr>
<td>Patient Care Management/Team roles</td>
<td>9</td>
</tr>
<tr>
<td>Patient / Family Education</td>
<td>10</td>
</tr>
<tr>
<td>Assessment of Patient Receiving PCA Therapy</td>
<td>10</td>
</tr>
<tr>
<td>Documentation</td>
<td>13</td>
</tr>
<tr>
<td>References</td>
<td>14</td>
</tr>
<tr>
<td>Appendix A: Pain Management Flow Sheet</td>
<td>15</td>
</tr>
<tr>
<td>Appendix B: Dr's Orders IV PCA</td>
<td>16</td>
</tr>
<tr>
<td>Patient Controlled Analgesia Competency Test</td>
<td>17</td>
</tr>
</tbody>
</table>
LEARNING OBJECTIVES

The purpose of this learning package is to provide nurses with information that will assist them in the care and management of patients with pain and the use of Patient Controlled Analgesia (PCA). The nurse is responsible and accountable for ensuring that they have the knowledge, skill and judgment to provide quality patient care.

By the completion of this learning package, the reader will:

- List the principles of PCA
- Indications for PCA
- State the role of the health care team members with regard to the use of PCA therapy
- Describe the assessment that is completed for patients who are using IV PCA
- Identify the opioids used with IV PCA and their side effects
- Describe the documentation required
Concepts of Pain Management

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage (IASP). Pain is a subjective phenomenon. Many factors make up a patient’s perception of pain including:

- previous experience with pain
- ethical, cultural and religious background
- myths about opioid use, such as; dependency and addiction
- the patient’s age
- the type of operation and the anaesthetic technique used

There are two major types of pain: acute and chronic (persistent pain). Below are the definitions.

**Acute Pain:** Usually brief duration (<3 mos.); subsides as healing takes place, has a predictable end; intensity may range from mild to severe; postoperative pain is classified as acute pain. Acute-postoperative pain may interfere with early ambulation, deep breathing and coughing and other patient activities which may prevent postoperative complications and speed recovery.

**Persistent Pain (Chronic Pain):** Prolonged, usually longer than 3-6 months; intensity may range from mild to severe.

Effective management of pain consists of the assessment of the pain; the treatment with appropriate pharmacologic and non-pharmacologic modalities; and, the evaluation and documentation of the effectiveness of the pain management plan.

**Patient Controlled Analgesia**

Patient Controlled Analgesia (PCA) is defined as the patient’s self-administration of analgesia. **PCA is simply a concept that supports the fact that pain is subjective and only the patient can feel the pain.** It allows the patient to actively participate in their pain management. PCA may be administered by oral, intravenous, subcutaneous, and epidural routes. This package will focus on the administration of IV PCA.

**How does IV PCA work?**

- The patient pushes a button (similar to call bell) to activate a pump that has been pre-loaded and programmed to deliver opioid analgesia.
- The pump delivers the dose of opioid into the patient’s intravenous.
- The frequency of delivery is controlled by an adjustable lockout period which prevents another dose delivery for a preset time.
- PCA accommodates a wide range of patient analgesic requirements by allowing self-titration to an individualized level of comfort.
When compared to conventional intramuscular analgesic injections, PCA therapy offers the following advantages:

**Patient Advantages**
- improved pain control preservation of self control
- may use less opioid
- rapid onset of analgesia and ability to titrate analgesia
- decreased anxiety
- ability to rapidly administer analgesic prior to mobilization thus reducing pain related to activity
- less tissue trauma due to injections
- ease of deep breathing and coughing
- increased satisfaction with pain management

**Nursing Advantages**
- decreased demand on nursing time
- decreased risk of needlestick injuries
- caring for patients who are comfortable
- increased patient satisfaction with care
- less time preparing injections

PCA eliminates the waiting periods (A and B) in a typical post-operative pain cycle.

PCA also eliminates wide fluctuations (peak and trough effects of plasma analgesic drug concentration.)
Definition of Terms for IV PCA (Pump Settings)

**Loading Dose**: (optional) - Dose(s) given in PACU, ICU or on the ward to frontload a Opioid, i.e., to bolus the patient with doses sufficient to reach a minimum effective analgesic concentration (MEAC) prior to the initiation of PCA; may also be given at other times to bolus a patient experiencing an episode of severe unrelieved pain.

**Delivery Mode**: The infuser delivers analgesia in one of three modes:
- **PCA mode**: a bolus of Opioid delivered only when the patient demands.
- **Continuous mode**: at preset continuous rate, no PCA dose available to the patient.
- **PCA + Continuous mode**: a preset continuous rate plus PCA demands available.

**Protocols**: Not currently used at NYGH

**Concentration**: At North York General Hospital we use the following drug concentrations:
- **Morphine** 1 mg/mL
- **Hydromorphone** 0.2mg/mL

**PCA Dose**: The dose of analgesia administered each time the patient activates the PCA device.

**Lockout Interval**: The time between doses during which the patient cannot activate the PCA (usually 5 minutes).

**Dose limit/ 4 Hour Limit**: The maximum dose limit allowed in a 4 hour period.
OPIOIDS USED WITH IV PCA:

Opioids assist in managing pain by acting as an agonist at specific opioid receptors sites in the Central Nervous System (CNS). By binding to the receptor, they help to block the transmission of pain through the CNS.

**Morphine:**
- a non-synthetic opioid analgesic binds to mu opiate receptors and blocks pain
- active metabolite is morphine-3-glucuronide (M-3-G) and morphine-6-glucuronide (M-6-G).

**Hydromorphone**
- A synthetic opioid
- 5 to 7 times more potent than morphine

**Common adverse effects (side effects) of opioids:**

<table>
<thead>
<tr>
<th>SIDE EFFECT</th>
<th>ETIOLOGY / MANAGEMENT</th>
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<tbody>
<tr>
<td>Nausea and Vomiting</td>
<td>opioids stimulate the chemoreceptor emetic trigger zone and vomiting centre in the brain</td>
</tr>
<tr>
<td></td>
<td>may be related to stimulation of the vestibular nerve or to delayed digestion</td>
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<td></td>
<td>manage with anti-emetic such as Dimenhydrinate/Gravol®, or ondansetron</td>
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<tr>
<td>Constipation</td>
<td>Opioids bind to GI receptors, resulting in decreased stomach motility and delayed passage of gastric contents</td>
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<tr>
<td></td>
<td>a decrease in fluid intake, inadequate diet and altered level of activity are also contributing factors</td>
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<tr>
<td></td>
<td>manage with stool softeners, laxatives, diet and mobility</td>
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<tr>
<td>Urinary Retention</td>
<td>tone in sphincter and smooth muscle of the bladder, decreased perception of the stimulus to void</td>
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<td></td>
<td>other factors related to urinary retention include site of surgery, age, length of anaesthesia and intra-operative intravenous volume</td>
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<td></td>
<td>If patient is unable to void, intermittent or Foley catheterization may be required.</td>
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<tr>
<td>Postural Hypotension</td>
<td>related to release of histamine, peripheral arteriolar and venous dilatation</td>
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<td></td>
<td><strong>NOTE:</strong> If the patient is well hydrated and supine, minimal to no changes in blood pressure or cardiac output occur.</td>
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<tr>
<td>Pruritus</td>
<td>thought to be related to histamine release</td>
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<tr>
<td></td>
<td>may respond to treatment with antihistamines such as Diphenhydramine/Benadryl®</td>
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<tr>
<td>Respiratory Depression</td>
<td>somnolence is a <strong>very good indicator</strong> of potential respiratory depression</td>
</tr>
<tr>
<td>(incidence &lt;1%)</td>
<td><strong>NOTE:</strong> If patient becomes increasingly somnolent, with a decreasing respiratory rate and depth, attempt to arouse the patient, call the Pain Service and attending team and anticipate the use of Naloxone (Narcan). An opioid antagonist (naloxone/Narcan®) and respiratory support must be readily available. The opioid antagonist <strong>NALOXONE</strong> is a specific antidote against respiratory depression. The recommended adult dose is 0.04 mg to 2 mg I.V. every 2-3 minutes as necessary.</td>
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<tr>
<td></td>
<td><strong>IV Push can only be administered by MD, RN’s in Emergency/ICU, PACU, L&amp;D, Endo (NYGH Guidelines for Administration of I.V. Medications)</strong></td>
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</tbody>
</table>
PATIENT SELECTION:
The following factors are considered in assessing patient’s suitability for PCA:

1. The cognitive and physical abilities (manual dexterity).
2. **Age** must be considered when using this method of pain management in the paediatric or elderly patient.
3. Can be used for **acute pain management** in those patients in whom moderate to severe pain is present or anticipated.
4. Patient’s **physical status** including respiratory, cardiovascular, hepatic and renal function must also be considered before initiation of treatment.
5. The patient must be **willing and motivated** to use this method of pain management.
6. A **history of opioid sensitivity or allergy** must also be considered prior to treatment.

PATIENT CARE AND MANAGEMENT/ TEAM ROLES

The following outlines the roles of various members of the inter-professional team while a patient is using IV PCA.

**Anesthesia/Acute Pain Service:**
- Patient selection
- Completion of PCA orders (Appendix B) and preassessment
- 24 hour management of patient’s pain while receiving PCA
- Management of complications associated with PCA
- Discontinuing PCA and transferring pain management to the appropriate services

**Pharmacy:**
- Supplying the opioid syringe through the routine Opioids and controlled medications distribution system

**Nursing:**
- Notifying the anaesthesiologist of patients who may be suitable for PCA.
- Set up and programming of the PCA pump based on anesthesia orders (pumps are in PAC unit, tubing in clean utility room, medications delivered by pharmacy)
- Ensuring that the PCA pump is connected on the IV line at the **port closest to the patient**
- The ongoing assessment and management of pain control effectiveness and side effects. These will be documented on the Pain Management Flow Sheet (Form 1680, Appendix A).

August 14, 2013
PATIENT / FAMILY EDUCATION

Patients must be given clear information about PCA and must fully understand how to use the PCA device if it is to be effective.

The following information related to PCA should be covered:

- Clarify expectations for pain management. We are aiming for a pain score of 4/10 or less (mild pain). We will not be able to eliminate the pain.
- The PCA pump is a machine containing pain medication, which will be connected to the IV.
- The patient must push the button to receive pain medicine.
- A small amount of opioid is administered when they push the button. Therefore they may need to use it more than once to get the pain under control. Patients should use the PCA pump to control pain to a level at which they feel comfortable.
- When to administer opioid:
  - when the pain becomes ‘uncomfortable’ (if they wait until the pain gets bad it will take more medication and longer to get it under control);
  - in a prophylactic manner to avoid “incidental” pain for example before exercise, movement or physiotherapy (anticipate the pain)
- Safety features such as the lockout interval and 4 hour limit aid in ensuring that the patient does not overdose on the medication.
- **only the patient should push the button.**
- The machine is programmed to deliver the right amount of pain medication.
- Possible side effects of the medications such as nausea, pruritus or somnolence. If they experience any of these side effects they should inform the health care team.
ASSESSMENT OF PATIENTS USING IV PCA

Nursing assessment is a key factor in the success of PCA. This is crucial to the early recognition of complications or side effects. The nurse caring for a patient receiving PCA therapy will regularly assess:

- the level of pain,
- the level of sedation,
- the respiratory rate,
- the presence of side effects and
- the dose delivered.

This information will be documented on the PowerChart or paper documentation on the Pain Management Flow Sheet. These assessments will be done in addition to the patient’s usual assessment.

<table>
<thead>
<tr>
<th>ASSESSMENT PARAMETERS</th>
<th>RATIONALE</th>
<th>FREQUENCY OF ASSESSMENT</th>
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<tbody>
<tr>
<td>Dose delivered/bolus dose</td>
<td>The amount of drug administered during a specific time period.</td>
<td>The dose will be assessed and recorded Q1H x 12 then Q4H or as ordered.</td>
</tr>
<tr>
<td>Cumulative dose</td>
<td>The total amount of medication received by the patient will be recorded.</td>
<td>The cumulative dose will be assessed and recorded Q1H x 12 H, then Q4H or as ordered.</td>
</tr>
</tbody>
</table>
| Respiratory Rate           | Respiratory depression in the respiratory centres in the pons and medulla, can decrease both rate and volume | Assess and record respiratory rate Q1H and PRN x12H, then Q4h and PRN or as ordered. *Call Anaesthesiologist and attending physician STAT if:  
  - Patient not rousable.  
  - Respiratory rate is Preschool <15  
    Child <12  
    Adolescent/Adult <10  
  - Evidence of respiratory depression (cyanosis, oxygen saturation <90%, apnea). |
<p>| Sedation                   | The first sign of altered respiratory function is most often a change in level of consciousness. | Assess and record Q1H and PRN x12 hours, then Q4H and PRN or as ordered. Sedation scale: |</p>
<table>
<thead>
<tr>
<th>Pain Management</th>
<th>Ineffective pain control is due to:</th>
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<tbody>
<tr>
<td></td>
<td>- Inadequate blood levels</td>
</tr>
<tr>
<td></td>
<td>- Opioid tolerance</td>
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<tr>
<td></td>
<td>- Malfunction of the PCA pump</td>
</tr>
<tr>
<td></td>
<td>- Low Opioid supply</td>
</tr>
<tr>
<td></td>
<td>- IV site</td>
</tr>
<tr>
<td></td>
<td>- IV tubing</td>
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<table>
<thead>
<tr>
<th>Side effects:</th>
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<tbody>
<tr>
<td>1. Nausea and vomiting</td>
</tr>
<tr>
<td>2. Pruritis</td>
</tr>
<tr>
<td>3. Urinary Retention</td>
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Unidentified side effects are difficult to manage. Unmanaged side effects lead to an unwillingness to use analgesics to manage pain.

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<thead>
<tr>
<th>Side effects</th>
<th>Side effects are assessed and documented Q4H and PRN.</th>
</tr>
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<tr>
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<td>* Call acute pain service/anesthesia on call if there is inadequate analgesia or difficulty in managing side effects.</td>
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<tr>
<th>Site/Dressing</th>
<th>If the IV is not infusing or the IV PCA tubing is not connected the patient will not receive analgesia as requested.</th>
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Assessed and documented Q4H and PRN. It is documented as satisfactory or unsatisfactory. If the IV requires restarting, the PCA tubing must be changed.
along with the IV tubing. It is not necessary to change the opioid vial/injector.

References


Patient Controlled Analgesia Competency Test

Name: __________________________ Unit: ________________
(Please Print)
Please choose the most correct answer:

1. Which of the following patients would benefit from PCA?
   1.) A patient who had abdominal surgery but does not speak English.
   2.) Confused, agitated post-operative patient.
   3.) A post-operative patient with chronic obstructive pulmonary disease.
   4.) An 80 year old woman with coronary artery disease, admitted to the ICU following knee surgery.
      a) 1, 2, 3
      b) 1, 2, 4
      c) 1, 3, 4
      d) 2, 3, 4

2. Advantages of PCA over IM/SC injections to manage pain include:
   1.) Improved pain control with less sedation.
   2.) Analgesia with a rapid onset, that is easier to titrate.
   3.) The fluctuations in a typical pain cycle are eliminated.
   4.) Less risk of addiction than with intermittent needles.
      a) 1, 2, 3
      b) 1, 2, 4
      c) 1, 3, 4
      d) 2, 3, 4

3. Which of the following are true about Morphine:
   1.) Morphine is a synthetic.
   2.) Morphine is the most commonly used opioid for pain management.
   3.) The onset for IV morphine is 5 - 15 minutes.
      a) 1, 2
      b) 2,
      c) 1, 2, 3
      d) 2, 3
4. The administration of morphine or hydromorphone may cause the following side effects:
   1.) Pruritus.
   2.) Nausea and Vomiting.
   3.) Urinary retention.
   4.) Tremors or seizures.

   a) 1, 2, 3
   b) 1, 2, 4
   c) 1, 3, 4
   d) 2, 3, 4

5. How often should the patient use the PCA opioid?

   1.) Whenever the patient experiences pain.
   2.) As frequently as the lockout allows until the patient’s level of comfort is reached.
   3.) As needed for sedation to assist with sleeping.
   4.) Before ambulating or doing something that will exacerbate pain.

   a) 1, 2
   b) 1, 3
   c) 1, 2, 3
   d) 1, 2, 4

6. A patient receiving an intravenous PCA opioid develops a marked decrease in respiratory rate or depth. Appropriate nursing actions include:
   1.) Attempting to rouse the patient (shaking patient, calling out name loudly).
   2.) check the oxygen saturation level.
   3.) Notifying the Acute Pain Service.
   4.) Increasing the lock-out time on the PCA pump.

   a) 1, 2
   b) 1, 3
   c) 1, 2, 3
   d) 1, 3, 4

7. True or False.
   Circle T for true and F for false for the following questions.

   T  F  If a patient is asleep they are not in pain.

   T  F  Family members should push the PCA button for a patient who is confused.

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The Acute Pain Service / Anesthesia can be reached 24 hours a day.

At NYGH the concentration of Hydromorphone is 0.2 mg/mL

The respiratory rate and sedation score is monitored every hour for the first 12 hours then every 4 hours and documented on Pain Management Flowsheet while the patient is on PCA.

If a patient is asleep family members can push PCA button

Short Answer

8. You have a patient who is to be started on PCA Morphine for pain management, how would you explain the following PCA concepts to this patient?
   a) PCA Dose_______________________________________________
   b) Lockout Interval___________________________________________
   c) 4 hour Limit_______________________________________________

9. The ‘PCA History’ should be checked as part of your routine assessment. What information does the history give you?
   a) __________________________________________________________
   b) __________________________________________________________

10. List four nursing actions that are important in your assessment of the patient who is receiving intravenous opioids via PCA. (As per the monitoring policy.)
   a) __________________________________________________________
   b) __________________________________________________________
   c) __________________________________________________________
   d) __________________________________________________________