

When purchasing a PCA pump

1. Perform a failure mode and effects analysis using the actual PCA pump under evaluation. Examples of questions to explore:
 - Can the pump be programmed easily to deliver the desired concentrations?
 - Could unsafe administration sets that allow free-flow be used accidentally?
 - Is the pump operation intuitive for the clinician and patient?
 - What are the default settings for the opiate concentrations in use?
 - Do the drugs, units of delivery, and strengths appear in a logical sequence?
2. Limit PCA pumps to a single model to promote proficiency with programming.
3. Before distributing the new pumps, verify that all pump default settings are set up as expected, and place a warning label on the activation button that states "FOR PATIENT USE ONLY."

Before prescribing, dispensing, or initiating a PCA

1. Require PCA prescribers to undergo a privileging process to verify proficiency with this form of pain management.
2. Limit the prescribing of fentanyl for epidural PCA to anesthesia staff, pain management teams, or critical care prescribers
3. Design standard order sets to guide drug selection, doses, and lockout periods; patient monitoring; and precautions such as avoiding concomitant analgesics, and how and when to administer oxygen and naloxone. Test the order sets using the pump's programming sequence to reduce the risk of errors.
4. Provide nurses with relevant information about opiates used for PCA. Alert them to the dangers of administering a dose for the patient (PCA by proxy) and the differences between hydromorphone and morphine.
5. Teach nurses and pharmacists how to program PCA pumps, and verify their ability to enter a PCA prescription accurately. Ensure that training occurs close to the introduction of new pumps, not months before use, and offer practice sessions as needed to maintain proficiency.
6. Run simulations in which staff purposely write incomplete orders; select an inappropriate drug or dose; misprogram a pump; ignore double checks; forget critical monitoring points; and miss obvious signs of toxicity so that clinicians can identify these at-risk behaviors.
7. Ensure that nurses recognize the signs and symptoms of opiate toxicity and withdrawal, the need to assess patients with minimal verbal or tactile stimulation, and the ability to distinguish between oversedation and other pulmonary, neurologic, or

- cardiovascular complications.
8. Provide ongoing education to clinicians about PCA errors to build awareness encourage internal and external (FDA, ISMP, USP) reporting of PCA errors.
 9. Require annual competency assessments for all professionals who prescribe, dispense, and administer PCA.
 10. Establish patient selection criteria for PCA. Candidates should have an appropriate level of consciousness and cognitive ability to self-manage pain. Infants, young children, and confused adult patients are unsuitable candidates.

When prescribing PCA

1. Require the use of PCA standard order sets (all sections completed) and limit verbal orders to dose changes.
2. Always dose PCA opiates in mg or mcg, not by volume (mL).
3. Check patient allergies before selecting the opiate used with PCA.
4. Use morphine as the opiate of choice. Use hydromorphone for patients who need very high doses of opiates. Reserve meperidine for patients who are allergic to both morphine and hydromorphone.
5. Consider other medications that the patient has received (e.g., analgesics taken at home, intraoperative medications) or currently has prescribed (e.g., antihistamines, nighttime sedatives) when determining the loading and maintenance doses.
6. Reassess the appropriateness of PCA therapy at regular intervals.

When dispensing PCA

1. Establish one standard concentration for each opiate used for PCA. Stock only the standard concentrations of morphine and hydromorphone in patient care units (meperidine for PCA should be dispensed from the pharmacy)
2. . Separate the storage of hydromorphone from morphine in the pharmacy and patient care units to avoid mix-ups.
3. Check patient allergies and ensure that they are listed in the interactive allergy field on the patient profile before entering programming orders into the computer.
4. Set maximum dose limits for PCA opiates in the pharmacy computer so an alert appears if safe doses are exceeded during order entry.
5. Affix prominent warnings if dispensing an opiate in a nonstandard concentration.
6. Use prefilled syringes/bags/cassettes whenever available commercially. Have pharmacy prepare all PCA formularies that are not commercially available.

7. Require a pharmacist to review all PCA orders before initiation (exception: when a pharmacist is not on site) and suggest dose adjustments or an alternative opiate when appropriate.
8. Use "tall man" lettering on pharmacy-applied labels for HYDROmorphine to help avoid confusion with morphine.
9. Alert clinicians to potential drug shortages with PCA opiates and, if encountered, recommend an alternative drug with clear dosing instructions.

When initiating PCA

1. Check patient allergies, which should be visible on the medication administration record (MAR), before initiating PCA.
2. Connect PCA to a port close to the patient (to avoid dead space) and prominently label the infusion line at this connection to avoid mix-ups with other lines.
3. Provide laminated instructions for programming PCA pumps for reference by nurses who may infrequently initiate PCA.
4. Require two clinicians to independently double-check the patient's identification, drug and concentration, PCA pump settings, and the line attachment before use (and before pump refill or programming change). Patientside bar-coding can be used to verify the patient and drug/concentration; however, pump settings may still require an independent double check.
5. Avoid nurse-controlled PCA unless special monitoring is in place.
6. Verify PCA settings each shift, immediately after receiving report.
7. Avoid administering concomitant opiates (an alert should appear on the MAR).
8. Have oxygen and naloxone readily available when initiating the device.
9. Educate patients about the proper use of PCA before initiation. Start during the preoperative testing visit so patients are not too groggy to understand. Warn family members and visitors about the danger of PCA-by-proxy.

When monitoring the effects of PCA

1. Establish a standard measurement scale to assess the patient's level of pain.
2. Develop monitoring requirements for patients who are receiving PCA and be alert for signs of oversedation. At a minimum, evaluate the patient's level of pain, alertness, and vital signs, including rate and quality of respirations, every 4 hours.
3. Evaluate all patients with minimal verbal and tactile stimulation to obtain an accurate assessment of their level of sedation.
4. Monitor patients more frequently during the first 24 hours and at night, when hypoventilation and nocturnal hypoxia may occur.

5. Establish risk factors that could increase respiratory depression (e.g., obesity or low body weight, concomitant medications that potentiate opiates, preexisting conditions such as asthma and sleep apnea) and determine the level of enhanced monitoring that would be required if these patients use PCA (e.g., capnography, apnea alarms at night).
6. Do not rely on pulse oximetry readings alone to detect opiate toxicity. Since capnography is currently not available for all PCA patients, reserve its use for those with a heightened risk of toxicity, and with nurse-controlled analgesia.
7. Keep flowsheets at the bedside to document PCA doses and patient monitoring.
8. Monitor the use of naloxone to identify adverse events related to PCA.