Avoiding Opiate Toxicity with Patient-Controlled Analgesia by Proxy

Matthew Grissinger, RPh, FASCP

Mr. Grissinger is a Medication Safety Analyst at the Institute for Safe Medication Practices in Huntingdon Valley, PA (www.ismp.org).

**Problem:** After a 72-year-old woman underwent cancer surgery, her surgeon prescribed patient-controlled analgesia (PCA) with a 2-mg morphine loading dose and 1 mg every 10 minutes as needed, for a maximum of 6 mg/hour. Initially, the patient was restless and agitated in the post-anesthesia care unit, but she remained obtunded (not alert) after surgery. Despite her inability to verbalize her pain, nurses pushed the PCA button and delivered frequent doses of morphine over the next 48 hours. Subsequently, the patient suffered a cardiorespiratory arrest and seizure, leading to hypoxic encephalopathy. She died several months later without ever having regained consciousness.

Several safety features exist with PCA to ensure that patients do not receive too much analgesia. These include a lockout interval that specifies the minimum amount of time between each dose and a maximum allowable amount that may be administered during a set time interval. Another often-overlooked “built-in” safety feature is the device’s purpose: it is intended for the patient’s use. Because sedated patients do not press the button to deliver more of the opiate, they are thus able to avoid toxicity. However, family members and health care professionals sometimes administer doses for patients, “by proxy,” hoping to keep them comfortable.

It should be noted that nurse-controlled analgesia may be appropriate in critical-care settings if protocols for patient selection have been established and appropriate assessment tools are in place to guide the level of pain and sedation. The patient described earlier, however, was not an appropriate candidate for PCA. Proper assessment tools were not used to guide nurse-controlled analgesia. This patient was at risk for morphine toxicity because she was obtunded and obese and had compromised lung capacity as a result of chronic obstructive pulmonary disease. Although her vital signs were recorded periodically (oxygen saturation monitoring was not used), the nurses did not recognize the signs of morphine toxicity. They continued to administer the analgesic despite the patient’s serious hypotension and shallow respirations.

**Safe Practice Recommendation:** The risk of overdoses with PCA can be reduced if these steps are followed:

- Selection criteria for PCA and nurse-controlled analgesia should be considered. Even though PCA can be used for a wide range of patients to safely manage pain (but not agitation or restlessness), some patients are not candidates for this modality because of their level of consciousness, psychological status, or limited intellectual capacity.

- It is essential to identify the types of patients who might be suitable for nurse-controlled analgesia. Any risk factors (e.g., age, weight, pre-existing conditions, concomitant medications) that would require increased monitoring should be established.

- The appropriateness of therapy should be assessed at regular intervals.

- Protocols and standardized order sets should be developed to guide the selection of drugs, dosing, lockout periods, and infusion devices.

- Meperidine should be avoided because of the risk of neurotoxicity.

- If hydromorphone is used, proper dosing must be ensured on the basis of narcotic equivalents.

- The use of other analgesics should be prohibited while PCA is being administered.

- Patients need to be carefully monitored. Because opiates, even at therapeutic doses, can suppress respiration, heart rate, and blood pressure, the need for monitoring and observation cannot be overemphasized.

- Particular attention is necessary for the first 24 hours and at night because the effects of opiate analgesics on intellectual functioning are not entirely predictable. Nocturnal hypoxia can be a serious adverse effect.

- Monitoring parameters should include regular clinical assessment of vital signs and alertness by pulse oximetry or capnography. A consistent pain scale should be used for the patient’s self-reported pain.

- If a support staff member takes vital signs, a clinician should review the information as soon as it is available. If continuous pulse oximetry or capnography is not available for all patients, it should be reserved for patients with a heightened risk of toxicity and when nurse-controlled analgesia is used.

- Two clinicians should be available to independently double-check patient identification and dose settings on the PCA device prior to use (and each pump refill) to detect possible errors.

- Patients and their families should be taught about the proper use of PCA beginning during the preoperative testing visit. Family members, significant others, and the staff should be alerted to the danger of pressing the button for the patient.
except when the patient requires physical assistance and has clearly expressed the need or desire for a bolus of medication.

- Staff members should receive training about the proper use of PCA. Clinicians should be taught to think critically about the cumulative dose that the patient would receive if the maximum dose limits were given.

- Staff members and clinicians should fully understand the hazards of using analgesics. With many fatal and adverse events related to these agents, perhaps it is time to run simulations for medical teams. “Actors” could purposely misuse analgesics so that the teams could identify and prevent the at-risk behaviors. For example, a re-enactment could involve writing incomplete orders; selecting an inappropriate drug, dose, or method of administration; misprogramming a pump; ignoring double-checks; forgetting critical monitoring points; and missing obvious signs of toxicity.

Editor’s Note: P&T would like to congratulate Michael Cohen, RPh, MS, ScD, FASHP, president of the ISMP, on receiving a MacArthur Foundation “genius award” for extraordinary creativity in his work on reducing medication errors. Dr. Cohen plans to spend his winnings on finding ways to prevent errors involving pediatric patients.

The reports described in this column were received through the USP-ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP (www.ismp.org) or the USP (www.usp.org) Website or communicated directly to ISMP by calling 1-800-FAIL SAFE or via e-mail at ismpinfo@ismp.org.