EVERY DAY IN hospitals nationwide, patients undergo surgery and receive large amounts of opioids for unrelieved postoperative pain, subsequently experiencing life-threatening opioid-induced respiratory depression.1 Based on the Joint Commission 2004 to 2011 database of reported opioid-related sentinel events, 47% of reported events were the result of a wrong dose, 29% from improper monitoring, and 11% due to other factors such as excessive dosing, medication interactions, and adverse effects.2 In its sentinel event alert, the Joint Commission underscored the need for hospital staff to focus on safe opioid administration and vigilant monitoring of the effects of opioids.2

By virtue of their assessment skills and unique 24-hour presence at the bedside, nurses are the patient’s primary pain managers.3 The perianesthesia nurse is the first to manage the patient’s pain after surgery, and as such, provides the first line of defense against opioid-related sentinel events in this population of patients. Perianesthesia nurses are also seen as leaders in health care facilities. In this role, they are capable of facilitating both institutional and personal practice changes that are necessary to reduce the incidence of opioid-related sentinel events. Table 1 provides an extensive list of strategies that must be undertaken to achieve improvements in the safety of inpatient opioid therapy. Following is a more in-depth discussion of two of the most important strategies: (1) implementation of multimodal analgesia and (2) improvement of monitoring practices.

**Current Approach to Postoperative Pain Management**

For many years, opioids have been the only type of analgesic in most postoperative pain treatment plans. Although opioids are considered to be the first-line choice for moderate-to-severe postoperative pain, the reliance on one drug (ie, the opioid) to do all the work of relieving moderate-to-severe pain frequently results in the need for high doses, followed by a high incidence of adverse effects. In the case of opioids, the most feared adverse effect is respiratory depression.1

One way to reduce the risk of life-threatening opioid-induced respiratory depression is to treat pain using a multimodal analgesic approach.3 Multimodal analgesia combines two or more analgesics with different underlying mechanisms of action to produce better pain relief at lower doses than would be possible with a single analgesic.4 The underlying rationale for this approach is that lower doses result in fewer or less severe adverse effects.1,5

Unless contraindicated, acetaminophen and a nonsteroidal anti-inflammatory drug should serve as the foundation of the pain treatment plan for every patient who undergoes surgery.6 Whenever possible, this combination should be initiated preoperatively or at the latest, on admission to the postanesthesia care unit and continued throughout the postoperative course.5,8 Local anesthetic approaches, such as continuous peripheral nerve blocks and epidural analgesia, should also be considered whenever indicated by the type of surgical procedure.9
Table 1. Strategies to Prevent Opioid-Related Sentinel Events After Discharge From the PACU

<table>
<thead>
<tr>
<th>Change the way pain is managed</th>
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<tbody>
<tr>
<td>1. Promote a practice culture that views opioid-only pain treatment plans as unacceptable (“red flag”).</td>
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<tr>
<td>2. Form a multidisciplinary task force (eg, nurses from the perianesthesia setting and postoperative clinical units, pharmacists, surgeons, and anesthesia providers) to evaluate current pain management practices with a focus on those that increase the incidence of adverse events.</td>
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<tr>
<td>a. Develop a process for identifying patients at the highest risk for opioid-induced adverse events preoperatively (Table 3).</td>
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<tr>
<td>b. Recognize the increased risk imposed by the coadministration of sedating adjuvant medications, such as benzodiazepines and antihistamines.1,10</td>
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<td>c. Remember that opioid pain relief is usually dose related rather than opioid related. Rather than an “opioid laundry list” approach, establish PACU opioid titration protocols based on the goals of care and the pharmacokinetics and pharmacodynamics of the first-line opioids. For example, use fentanyl in patients with severe pain on admission to PACU and in those with an end-organ failure; otherwise, titrate using the opioid the patient is likely to receive after discharge from the PACU.1</td>
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<tr>
<td>d. Understand that many factors influence pain relief and there is no specific dose that will relieve pain of a specific intensity. Do not prescribe and administer opioid doses based on pain intensity ratings, for example, 2 mg intravenous (IV) morphine for pain ratings of 1 to 3 (on a scale of 0 to 10); 4 mg IV morphine for pain ratings of 4 to 6; and 6 mg IV morphine for pain ratings greater than 6.1 Evaluate multiple factors, including sedation level, respiratory status, opioid tolerance, age, comorbidities, and pain intensity, when selecting an opioid dose.</td>
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<tr>
<td>e. Do not establish PACU discharge criteria that require pain intensity be reduced to an arbitrary level (eg, 4 on a scale of 0 to 10) before transfer to the clinical unit. Pain control is best viewed on a continuum and is the responsibility of every member of the health care team. Further titration after discharge from the PACU maybe necessary and should be an accepted practice on the clinical units.</td>
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<tr>
<td>3. Review the relevant literature and develop multimodal pain treatment plans that have been shown to improve pain control while reducing opioid dose.1,6</td>
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<tr>
<td>4. Expand the hospital formulary to provide reasonable options that will support multimodal analgesia, for example, IV, oral, and rectal acetaminophen and NSAIDs.6,8</td>
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<tr>
<td>a. Although the cost of a drug is an important consideration, decisions about which analgesics will be available to the health care team should be based on the overarching goal of improving patient outcomes.</td>
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<tr>
<td>5. Include nonpharmacologic options in multimodal pain treatment plans.</td>
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<tr>
<td>a. Implement creative approaches to increase the use of nonpharmacologic methods such as teaching pastoral care counselors and selected volunteers how to provide cognitive-behavioral approaches, including meditation, relaxation breathing, music therapy, and guided imagery, as well as when to suggest to the nursing staff the use of physical modalities, such as cold and heat therapy.</td>
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<tr>
<td>6. Optimize pain treatment in patients with pre-existing chronic pain.</td>
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<tr>
<td>a. Provide surgeons with information about which analgesics may be continued and which should be discontinued preoperatively in patients with pre-existing pain.16</td>
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<tr>
<td>b. Establish a process for identifying patients with chronic pain preoperatively, so that their pain treatment can be optimized before the additional pain of surgery is inflicted.17</td>
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<tr>
<td>c. Contact the surgeon and/or anesthesiologists (preoperatively whenever possible) for analgesic orders in patients with poorly controlled chronic pain.</td>
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<tr>
<td>d. Consider the preoperative administration of anticonvulsants to treat and prevent neuropathic pain.18</td>
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</table>

Establish monitoring practices that enhance decision making

1. Review current institutional monitoring practices for all opioid therapies and identify and correct those that may contribute to delayed detection of patient deterioration.

2. Review and apply evidence-based recommendations such as those presented in the American Society for Pain Management Nursing Evidence-based Guideline on monitoring for sedation and respiratory depression.10,14

a. Require systematic assessment of sedation and respiratory status in all patients receiving opioid therapy regardless of the type of opioid, dose, or route or method of administration (Table 2).1,2.10.12.13

i. Expect nurses to reduce opioid dose as soon as increased sedation levels are detected (Table 2).14

(Continued)
To address the need for mechanical monitoring, consider the following risk factors (Table 3):1,10

1. If mechanical monitoring is deemed necessary, provide it continuously rather than by intermittent spot checks.
2. If intermittent monitoring is implemented, ensure proper sedation and respiratory assessments are conducted.
3. Systematically evaluate the need for mechanical monitoring based on the patient’s condition.
4. If a patient’s condition warrants closer monitoring than can be provided on the current clinical unit, the patient should be promptly moved to a more closely monitored setting.1

Increase monitoring of sedation and respiratory status when other sedating medications, such as benzodiazepines and antihistamines, are coadministered with opioids.1,10,14

Ensure that the hospital protocol supports the nurse’s administration of diluted naloxone by titration-to-effect technique when clinically significant opioid-induced respiratory depression is detected (footnote 3 in Table 2).1

Provide comprehensive education
1. Educate primary care providers and staff on the compelling and urgent need for routine use of multimodal analgesia.
2. Teach all nursing staff the importance and proper technique for assessment of respiratory status (depth, regularity, and rate obtained by watching the “rise and fall” of the patient’s chest during respiration).12
3. Reinforce that snoring is a respiratory obstruction and should be promptly evaluated.
   a. Teach ancillary staff and visitors to promptly report excessive sedation and snoring to nursing staff.
4. Teach nurses how to interpret and when to report the data obtained from respiratory assessment and mechanical monitoring, that is, recognition of trends that may indicate deterioration.
5. Talk with patients and families about pain (preoperatively whenever possible):
   a. Describe the purpose and the intention to use multimodal analgesia and that opioids are just one analgesic that will likely (but not always) be used in the treatment plan.
   b. Establish comfort-function goals with patients by explaining that “zero” pain is unrealistic and rarely occurs after the surgery, but that the staff will accept their reports of pain and try to provide pain control that will help them accomplish their functional goals with relative ease.19
   c. Remind patients that they may experience pain on awakening after the surgery and that medication will be provided with a focus on safely reducing the pain. Emphasize that safety always comes first!
   d. Reinforce practices that reduce patient risk for opioid-induced adverse events, such as patient-only use of patient-controlled analgesia.

Evaluate personal practice
1. If nonopioid analgesics have not been prescribed, promptly contact the primary care provider for orders that insure a nonopioid foundation for the treatment of postoperative pain for all patients undergoing surgery.
2. Implement multimodal pain treatment plans preoperatively whenever possible.
   a. Remind primary care providers that many nonopioids have minimal or no effect on bleeding time and can be given preoperatively or intraoperatively.6,8,17
3. Apply the principles of safe pain management.
   a. Appreciate the potency of the first-line opioids. By the IV route, 1 to 2 mg of morphine provides approximately the same analgesia as 0.1 to 0.2 mg of hydromorphone and 10 to 20 mcg of fentanyl.1
   i. Question the safety of a starting dose greater than 0.4 to 0.5 mg of hydromorphone in opioid-naive patients.
   b. Reduce opioid dose in high-risk populations (Table 3).1
   c. Titrate opioids slowly and allow enough time to evaluate the patient response before administering subsequent doses.1
   d. Recognize that “falling asleep” during an opioid titration indicates the patient is excessively sedated. Stop titration and allow the patient to “catch up.”1
Early intervention is essential to prevent opioid-related adverse events. As the first person to manage the patient’s postoperative pain, the peri-anesthesia nurse must be on the alert when opioid-only pain treatment plans are prescribed and aggressively advocate for multimodal approaches instead.

### Current Monitoring Practices

There is a widespread agreement that there is an urgent need to improve the way patients are monitored during opioid therapy. Sedation precedes opioid-induced respiratory depression, which underscores the importance of systematic sedation assessment during opioid therapy, regardless of the opioid, dose, or route or method of administration. A simple sedation scale is recommended to facilitate communication and decision making among the members of the health care team (Table 2).

Adequate respiratory assessment is lacking nationwide. The recommended method for assessment of respiratory status requires the nursing staff to observe the rise and fall of the patient’s chest. The assessment also includes insuring adequate respiratory depth and regularity and listening to the patient breathe in addition to counting the respiratory rate. The respiratory assessment should be done before arousing the sleeping patient.

Snoring indicates respiratory obstruction and should be attended to promptly by arousing and repositioning the patient. Even subtle snoring can progress to a full obstruction and so must be addressed. Many times patients or family members report that snoring is “normal” because the patient snores at home. This thinking can lead to fatal consequences. In the home setting, patients are typically awakened by their own snoring and ineffectual respiration; however, in the context of opioid administration and other sedating medications, patients maybe too sedated to self-arouse. Under these circumstances, snoring is an ominous sign and requires the nurse to further evaluate the patient to avert disaster. Patients, families, and ancillary staff should also be taught to recognize both snoring and excessive sedation as abnormal and report them promptly to the nursing staff.

### Mechanical Monitoring

The American Society for Pain Management Nursing recommends that every patient’s risk factors be considered when determining the need for mechanical monitoring during an opioid administration. Table 3 illustrates the many high-risk patient-specific and iatrogenic factors that warrant consideration of continuous mechanical monitoring.

Although pulse oximetry is the most commonly used mode of mechanical monitoring during opioid

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**Table 1. Continued**

| e. Do not administer a specific dose to achieve a specific pain intensity. The relationship between opioid dose and pain intensity is not linear. Consider multiple factors, including sedation level, respiratory status, and risk factors for opioid-induced respiratory depression, when determining whether or not to administer more opioid to a patient. |
| f. View pain control on a continuum with the understanding that further titration maybe necessary after discharge from the PACU. Patient safety always comes first! |
| g. Before the transfer to the clinical unit, obtain a baseline sedation level using the same sedation scale that is used to assess unwanted sedation on the clinical units. |
| i. Patients are often sedated at discharge from the PACU as a result of anesthesia and other sedating medications given in the operating room and PACU. Inform the receiving nurse on the clinical unit whenever a patient has a sedation level of 3, so that opioid doses can be reduced or held and the patient watched closely until the sedation level improves. |
| h. On transfer to the clinical unit, provide the receiving nurse with a comprehensive report of how pain was managed, including what medications and doses were administered, how well the medications were tolerated, and the patient’s current pain intensity and sedation level. Inform the receiving nurse if the patient has any high-risk factors for an opioid-related sentinel event. |

PACU, postanesthesia care unit; NSAID, nonsteroidal anti-inflammatory drug.
administration, it has numerous pitfalls including that it measures oxygenation, but does not measure ventilation.\(^1,10\) Low oxygen saturation levels as measured by the pulse oximetry are considered a late indicator of respiratory depression.\(^1,10\)

Another recognized disadvantage of pulse oximetry is that it will yield high oxygen saturation readings in patients who are receiving supplemental oxygen. Dark skin pigmentation and poor perfusion may also affect accuracy.\(^1,10\)

The reliance on intermittent “spot-check” pulse oximetry readings is particularly misleading and dangerous because respirations are often adequate while the patient is awake but become rapidly insufficient during sleep.\(^1,2,10,12\) The process of applying the pulse oximeter sensor to obtain a periodic reading is likely to stimulate the patient to take a deep breath. This can yield a higher oxygen saturation reading than when the patient has not been stimulated.\(^12\) Such readings can lead to false assumptions and a failure to intervene to prevent an adverse outcome.

If pulse oximetry is implemented as a means of monitoring during opioid therapy, it should be done continuously. If this is not possible, staff should be aware of the shortcomings of obtaining intermittent readings and the need for proper sedation and respiratory assessments reinforced. If a patient’s condition warrants closer monitoring than can be provided on the current clinical unit, the patient should be promptly transferred to a more closely monitored setting.\(^1\)

Capnography (end-tidal CO\(_2\) monitoring) is considered an accurate tool for the measurement of perfusion and ventilation, and a sensitive and early predictor of impending respiratory depression.\(^1,10,12\) Research shows that capnography can

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**Table 2. Pasero Opioid-Induced Sedation Scale (POSS) With Interventions**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Sleep, easy to arouse</td>
<td>Acceptable, no action necessary, may increase opioid dose if needed</td>
</tr>
<tr>
<td>1</td>
<td>Awake and alert</td>
<td>Acceptable, no action necessary, may increase opioid dose if needed</td>
</tr>
<tr>
<td>2</td>
<td>Slightly drowsy, easily aroused</td>
<td>Acceptable, no action necessary, may increase opioid dose if needed</td>
</tr>
<tr>
<td>3</td>
<td>Frequently drowsy, drifts off to sleep during conversation</td>
<td>Unacceptable, monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory, decrease opioid dose (25%) to (50%)(^1) or notify primary(^1) or anesthesia provider for orders, consider administering a nonsedating, opioid-sparing nonopioid, such as acetaminophen or an NSAID, if not contraindicated, ask patient to take deep breaths every 15 to 30 min.</td>
</tr>
<tr>
<td>4</td>
<td>Somnolent, minimal or no response to verbal and physical stimulation</td>
<td>Unacceptable, stop opioid, consider administering naloxone(^x),(^y), stay with the patient, stimulate, and support respiration as indicated by the patient status, call Rapid Response Team (Code Blue) if indicated, notify primary(^1) or anesthesia provider, monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory.</td>
</tr>
</tbody>
</table>

NSAID, nonsteroidal anti-inflammatory drug.

\(^1\)Appropriate action is given in italics at each level of sedation.

\(^1\)Opioid analgesic orders or a hospital protocol should include the expectation that a nurse will decrease the opioid dose if a patient is excessively sedated.

\(^1\)For example, the physician, nurse practitioner, advanced practice nurse, or physician assistant responsible for the pain management prescription.

\(^1\)For adults experiencing respiratory depression, mix 0.4 mg of naloxone and 10 mL of normal saline in syringe and administer this dilute solution very slowly (0.5 mL over 2 min) while observing the patient’s response (titrate-to-effect). If sedation and respiratory depression occur during administration of transdermal fentanyl, remove the patch; if naloxone is necessary, treatment will be needed for a prolonged period and the typical approach involves a naloxone infusion. Patient must be monitored closely for at least 24 h after discontinuation of the transdermal fentanyl.

\(^1\)Hospital protocols should include the expectation that a nurse will administer naloxone to any patient suspected of having life-threatening opioid-induced sedation and respiratory depression. Used with permission from Pasero et al\(^1\) (Copyright Pasero C, 1994).
detect a compromised respiratory status before oxygen desaturation or diminished chest excursions are observed. Advances are underway to improve this technology so that it is more practical for routine application in the clinical setting.

The inadequacy of current technology underscores an urgent need for industry to develop monitoring systems that recognize patterns and evaluate trends in respiration. Nevertheless, it is crucial that nurses embrace their role as the patient’s best monitor, be aware of risk factors for opioid-induced respiratory depression, and take prompt action when they see early signs of patient deterioration (eg, increasing sedation levels or shallow respirations).

**Summary**

As Table 1 illustrates, multiple changes are needed to improve the safety of opioid therapy in the hospital setting. It is imperative that hospitals establish a multidisciplinary approach to identify the many practices that put patients at risk for catastrophic opioid-related adverse events postoperatively and implement strategies that will minimize these risks. Perianesthesia nurses are key to the success of such an extensive and important initiative.
References


