Chapter 5

Pain Management

Chris Pasero, MS, RN-BC, FAAN & Sarah Brynelson, RN-BC, MS, CNS

Perianesthesia nurses have an active and pivotal role in the management of pain. They teach patients about the pain experience before surgery and are the first defense in preventing and fighting pain after surgery. They are the patient's advocate when adjustments in the treatment plan must be made to optimize pain relief. This chapter discusses the types of pain seen in the perioperative setting and the analgesics used to treat patients. Practical tips on the management of patients who are opioid tolerant, those with chronic (persistent) pain, and patients with addictive disease are provided. The importance of providing both effective and safe pain relief is emphasized throughout the chapter.

1. What is the definition of pain?

The International Association for the Study of Pain (IASP) (2011) and the American Pain Society (APS) (2008) define pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." This definition describes pain as a complex phenomenon with multiple components that impacts a person's psychosocial and physical functioning (McCaffery, Herr, & Pasero, 2011). The accepted clinical definition of pain, which was proposed by Margo McCaffery in 1968 and is now accepted worldwide, reinforces that pain is a highly personal and subjective experience: "Pain is whatever the experiencing person says it is, existing whenever he says it does" (McCaffery, 1968).

2. What is the difference between acute pain and chronic (persistent) pain?

Acute pain follows tissue damage (e.g., surgery) with a distinct onset and relatively brief duration that subsides as healing takes place (Vadivelu, Whitney, & Sinatra, 2009). Chronic pain persists beyond the expected period of healing, which explains why it is also called persistent pain (Pasero & Portenoy, 2011). It can occur from multiple causes (e.g., cancer, noncancer syndromes), may have a gradual or distinct onset, is often refractory to treatment, and serves no useful purpose (Vadivelu, Whitney, & Sinatra, 2009).

3. What is the difference between nociceptive pain and neuropathic pain?

Nociception refers to the normal functioning of physiologic systems that leads to the perception of noxious stimuli as being painful (Pasero & Portenoy, 2011). In short, it means "normal" pain transmission occurs when tissue damage (e.g., surgical incision) produces enough noxious stimuli to activate free nerve endings (nociceptors) and initiate the transmission of pain. Somatic (bone) and visceral (organ) pain are types of nociceptive pain. In contrast to nociceptive pain, neuropathic pain is sustained by the abnormal processing of stimuli from the peripheral or central nervous system or both (Pasero & Portenoy, 2011).

4. What is the best way to assess pain in patients who can report pain in the postanesthesia care unit?

The gold standard of pain assessment is the report of pain by patients who are capable of doing so (APS, 2008; McCaffery, Herr, & Pasero, 2011). A comprehensive assessment includes the patient's description of the pain, including its location, duration, what aggravates and relieves it, and its intensity. Pain intensity is rated by the patient using a reliable and valid pain assessment tool, such as the 0 to 10 numerical pain rating scale (NRS), Wong-Baker FACES scale, or the Faces Pain Scale–Revised (FPS-R) (www.painsourcebook.ca) (McCaffery, Herr, & Pasero, 2011). Some patients prefer a verbal descriptor scale (VDS), which uses words that correlate with the NRS, such as no pain (0), mild pain (1–3), moderate pain (4–6), or severe pain (7–10).

5. What is the best way to assess pain in patients who cannot report pain in the PACU?

Many patients in the postanesthesia care unit are unable to provide a report of their pain because they are sedated from anesthesia and/or other drugs given during surgery. Some may be cognitively impaired or critically ill (e.g., intubated, unresponsive), and some may be too young (e.g., infants, small children) to report their pain using customary self-report pain assessment tools. These patients are collectively referred to as those who are "unable to self-report" (Herr, Coyne, McCaffery, Manworren, & Merkel., 2011). When patients are unable to report pain using traditional methods, an alternative approach based on the Hierarchy of Importance of Pain Measures (McCaffery & Pasero, 1999) is recommended (Herr et al., 2011; McCaffery, Herr, & Pasero, 2011; Pasero, 2009a). The key components of the hierarchy are to (1) attempt to obtain self-report; (2) consider underlying pathology or conditions and procedures that might be painful (e.g., surgery); (3) observe behaviors; (4) evaluate physiologic indicators; and (5) conduct an analgesic trial (see **Table 5-1**).

TABLE 5-1. Hierarchy of Importance of Pain Measures

1. Attempt to obtain the patient's self-report, the single most reliable indicator of pain.
2. Consider the patient's condition or exposure to a procedure that is thought to be painful. If appropriate, assume pain is present (APP); if approved by institution policy and procedure, document APP.
3. Observe behavioral signs (e.g., facial expressions, crying, restlessness, and changes in activity). A surrogate who knows the patient (e.g., parent, spouse, caregiver) may be able to provide information about underlying painful pathology or behaviors that may indicate pain.
4. Evaluate physiologic indicators with the understanding that they are the least sensitive indicators of pain and may signal the existence of conditions other than pain or a lack of it (e.g., hypovolemia, blood loss).
5. Conduct an analgesic trial to confirm the presence of pain and to establish a basis for developing a treatment plan if pain is thought to be present.

Data from Herr, K., Coyne, P. J., McCaffery, M., Manworren, R., & Merkel, S. (2011). Pain assessment in the patient unable to self-report: Position statement with clinical practice recommendations. *Pain Management Nursing, 12*(4), 230–250; McCaffery, M., Herr, K., & Pasero, C. (2011). Assessment: Basic problems, misconceptions, and practical tools. In C. Pasero & M. McCaffery, *Pain assessment and pharmacologic management* (pp. 13–177). St. Louis: Mosby; McCaffery, M., & Pasero, C. (1999). Assessment: Underlying complexities, misconceptions, and practical tools. In M. McCaffery & C. Pasero (Eds.), *Pain: Clinical manual* (2nd ed., pp. 35–102). St. Louis, MO: Mosby.

6. Is it acceptable to assume that pain is present in patients who cannot report pain after surgery?

When a self-report cannot be obtained, the Hierarchy of Importance of Pain Measures (Table 5-1) directs the clinician to consider the presence of a potentially painful condition (e.g., surgery) or pathology (e.g., cancer). When such conditions exist, nurses should assume that pain is present and should provide appropriate treatment, such as the administration of starting doses of analgesics. This action is commonplace in PACUs where nurses appropriately assume surgery is painful and administer analgesics, regardless of the patient's ability to report pain (Pasero, 2009a).

Nurses should never presume that patients cannot feel pain and should realize that medications such as neuromuscular blocking agents, propofol (Diprivan), and midazolam (Versed), do not produce analgesia (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). When pain is assumed to be present, the condition thought to be present is documented, and when approved by institutional policy and procedure, the abbreviation APP (assume pain present) may be used (McCaffery, Herr, & Pasero, 2011; Pasero & McCaffery, 2002).

7. Are behaviors reliable indicators of pain?

Patients' behaviors may provide clues about whether or not they have pain. For example, facial expressions, restlessness, bracing, and changes in activity have been shown to be indicators of pain in patients who are unable to self-report (Gelinas, Fillion, Puntillo, Viens, & Fortier, 2006; Hadjistavropoulos et al., 2007; Herr et al., 2011; McCaffery, Herr, & Pasero, 2011; Pasero, 2009a).

A number of behavioral pain assessment tools have been tested in patients who cannot report pain; for example, the Critical Care Observation Tool (CCOT) for patients who are critically ill (Gelinas, Fillion, Puntillo, Viens, & Fortier, 2006; Gelinas, Harel, Fillion, Puntillo, & Johnston, 2009; Gelinas & Johnston, 2007). Although behavioral pain assessment tools help to determine whether patients have pain, a limitation of many of them

is that they designate specific behaviors, such as body movements and muscle tension, which must be observed and scored depending on the extent to which the behaviors are present. Appropriate use of these tools requires nurses to carefully evaluate each patient's ability to respond with the requisite behaviors specified by the tool to prevent undertreatment of pain (Pasero, 2009a). For example, tools that require assessment of body movement are not appropriate for use in patients who cannot move, such as those receiving a neuromuscular blocking agent. In such patients, the recommended approach is to assume pain is present (see Table 5-1) and provide recommended doses of analgesics. This assumption can be justified by research that has shown that endotracheal intubation, ventilation, and suctioning—all required in patients receiving a neuromuscular blocking agent—are painful (Puntillo et al., 2001; Stanik-Hutt, Soeken, Belcher, Fontaine, & Gift, 2001).

8. Is a behavioral pain score the same as a pain intensity rating?

A common pitfall of using behavioral pain assessment tools is the tendency of clinicians to draw conclusions about the intensity of a patient's pain based on the behavioral score the tool yields (Pasero, 2009a). There is no research that shows that a certain behavior or number of behaviors indicate a certain pain intensity. For example, one patient may lie completely still and quiet, and another may grimace and be restless, but both may be experiencing severe pain. It is essential that nurses use behavioral tools to help determine the presence of pain and to guide treatment with the understanding that behavioral tools are *not* pain intensity rating scales. If a patient cannot report pain intensity, the exact intensity of the pain cannot be known (Pasero & McCaffery, 2005a).

9. Are physiologic parameters, such as blood pressure and pulse, reliable indicators of pain?

Although nurses often rely on physiologic indicators such as an elevated heart rate or blood pressure when assessing pain, these parameters are not considered good indicators of pain (McCaffery, Herr, & Pasero, 2011). Research has shown that vital signs are not consistent with pain and such indicators should be used with caution (Arbour & Gelinas, 2009; Gelinas & Arbour, 2009). Increases in heart rate or blood pressure may occur with sudden, severe pain; however, the human body seeks equilibrium and quickly adapts (Pasero, 2009a). In addition, other factors such as hypovolemia, hypothermia, and some anesthetics may influence vital signs.

10. Should patients be asked to establish a pain rating goal preoperatively?

Prior to surgery, patients should be told by their surgeon and preadmission nurses about the functional goals of postoperative care and the importance of being comfortable enough to accomplish those goals with relative ease (also called comfort-function goal). For example, patients need to breathe deeply, cough, and ambulate or participate in physical therapy during the postoperative period. It is important to remind patients when establishing a comfort-function goal that pain ratings above a 3/10 have been found to interfere with optimal activity (McCaffery, Herr, & Pasero, 2011). Although it is not always possible to achieve a patient's pain rating goal in the short time a patient is in the PACU, the goal provides direction for pain treatment during the continuum of care.

11. Should the criteria for discharge from the PACU include the requirement that patients must achieve their pain rating goal?

The quality of patients' pain control should be addressed when they are discharged from one clinical area to another. Many short stay units, outpatient surgery units, and PACUs establish the criterion that patients must achieve a pain rating of 4/10 or better before discharge; however, the expectation that all patients must be discharged from these areas with pain ratings below an arbitrary number is unrealistic and can lead to the unsafe administration of further opioid doses to patients who are excessively sedated, which is widely discouraged (Blumstein & Moore, 2003; Lucas, Vlahos, & Ledgerwood, 2007; Pasero, 2014; Vila et al., 2005). Instead, achieving optimal pain relief is best viewed on a continuum with the primary objective being to provide both effective and safe analgesia (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Optimal pain relief is the responsibility of every member of the healthcare team and begins with analgesic titration in the PACU followed by continued prompt assessment and analgesic administration after discharge from the PACU to achieve pain ratings that allow patients to meet their functional goals with relative ease.

Although it may not always be possible to achieve a patient's pain rating goal within the short time the patient is in an area such as the PACU, this goal provides direction for ongoing analgesic care. Important information to give to the nurse that is assuming care of the patient on the clinical unit is the patient's pain rating goal, how close the patient is to achieving it, what has been done thus far to

achieve it (analgesics and doses), and how well the patient has tolerated analgesic administration (adverse effects).

12. What is the recommended approach for the management of pain in the immediate postoperative period?

Pain is a complex phenomenon involving multiple underlying mechanisms. These characteristics mandate the use of more than one analgesic, sometimes provided by more than one route of administration, to manage immediate and ongoing postoperative pain. Guidelines recommend the use of multimodal analgesia as a means of reducing postoperative opioid doses and preventing clinically significant opioid-induced adverse effects (American Society of Anesthesiologists [ASA], 2012). For example, numerous studies have demonstrated that the combination of nonopioids (e.g., acetaminophen and nonsteroidal anti-inflammatory drugs [NSAIDs]) with other analgesics (e.g., opioids and local anesthetics) can produce better analgesia with fewer adverse effects than any single analgesic administered alone (American Pain Society, 2016; ASA, 2012; Derry, Derry, & Moore, 2013; Gritsenko, Khelemsky, Kaye, Vadivelu, & Urman, 2014; Jarzyna et al., 2011; Joshi, Schug, & Kehlet, 2014; Pasero & Stannard, 2012; Maund et al., 2011; Santosa, Ulm, Jennings, & Wan, 2014). A strong nonopioid foundation before opioid administration is strongly encouraged (Jarzyna et al., 2011; Pasero & Stannard, 2012; The Joint Commission, 2012). Nonpharmacologic approaches such as proper positioning and the application of heat or cold should be added to complement the pharmacologic treatment plan (The Joint Commission, 2012).

13. What is the difference between multimodal analgesia and polypharmacy, and how can the risks associated with polypharmacy be minimized?

The term *polypharmacy* carries a negative connotation, in contrast to multimodal therapy or combination therapy. Whereas multimodal therapy is based on rational combinations of analgesics with differing underlying mechanisms to achieve the greatest benefit in pain control, polypharmacy suggests the use of drug combinations that are irrational and less effective or less safe than would be a regimen that had fewer or different agents (Pasero & Portenoy, 2011). For example, combining two NSAIDs in a treatment plan is not advised as this is unlikely to improve analgesia and would increase the patient's risk of GI toxicity (Pasero, Portenoy, & McCaffery, 2011). Important principles of safe drug administration are to be aware of the potential for interactions specific to each analgesic and to avoid unnecessary duplicate prescribing that can lead to toxicities (Hanks, Roberts, & Davies, 2004).

14. What is preemptive analgesia and does it work?

In the scientific literature, the term *preemptive analgesia* is used when discussing research that compares the effects of preoperative administration of a single (most often) analgesic intervention, such as local anesthetic surgical site infiltration or oral opioid administration, with the effects of this same intervention administered immediately after surgery on the intensity of postoperative pain. Many clinicians have proposed that a more appropriate term and approach in the clinical setting is *protective analgesia*, whereby aggressive and sustained multimodal interventions are initiated preoperatively and continued throughout the intraoperative and postoperative periods (Joshi, Schug, & Kehlet, 2014). Consistent with this strategy are the goals of immediate postoperative pain reduction and prevention of postsurgical pain syndromes (Pasero, 2011). In addition, the initiation of multimodal analgesic interventions preoperatively or as soon as possible postoperatively facilitates the administration of the lowest effective analgesic doses during the critical immediate postoperative period when patients are likely to experience both excessive sedation from anesthetics and other drugs and severe pain (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

15. What are the primary pharmacologic strategies for the management of postoperative pain?

There are a number of pharmacologic strategies for the management of postoperative pain, and all involve the administration of one or more of the most common types of analgesics used in the postoperative period:

- Nonopioids, including oral, rectal, or IV acetaminophen and the NSAIDs (e.g., IV ketorolac or ibuprofen, oral or rectal celecoxib, ibuprofen, or naproxen)
- Opioids, including the first-line options, fentanyl, hydromorphone, morphine, and oxycodone
- Local anesthetics, most often bupivacaine and ropivacaine, used alone for peripheral nerve blocks or in combination with opioids for epidural analgesia
- Anticonvulsants, including gabapentin and pregabalin

TABLE 5-2. First-line IV Opioids Administered for Postoperative Pain Management: Pharmacokinetic Information

Opioid	Onset (min)	Peak (min)[1]	Duration (hrs)[2]	Half-life (hrs)
Morphine	0–10	15–30	3–4	2–4
Hydromorphone	5	15–30	3–4	2–3
Fentanyl	3–5	15–30	2	3–4

[1]Of all of the routes of administration, IV produces the highest peak concentration of the drug, and the peak concentration is associated with the highest level of toxicity (e.g., sedation). To decrease the peak effect and lower the level of toxicity, IV boluses may be administered more slowly or smaller doses may be administered more often.
[2]Duration of analgesia is dose dependent; the higher the dose, usually the longer the duration.
Data from Pasero, C., Quinn, T. E., Portenoy, R. K., McCaffery, M., & Rizos, A. (2011). Opioid analgesics. In C. Pasero & M. McCaffery (Eds.), *Pain assessment and pharmacologic management* (pp. 277–622). St. Louis, MO: Mosby.

A variety of routes of administration are used to deliver analgesics in the perioperative setting as well. Many of the methods used to manage postoperative pain are accomplished via catheter techniques such as epidural analgesia and continuous peripheral nerve block infusions. Nurses play a key and extensive role in the successful management of these therapies, and the American Society for Pain Management Nursing (ASPMN) provides guidelines for care (Pasero, Eksterowicz, Primeau, & Cowley, 2007; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

16. Which first-line opioid is best to treat immediate postoperative pain, and is there value in using more than one for this type of pain?

The mu-agonist opioids, morphine, hydromorphone, and fentanyl, are the most commonly used for initial IV titration for the treatment of postoperative pain. Important patient characteristics to consider when selecting an opioid include previous exposure and tolerance of opioids, current organ function, and hemodynamic stability. For example, fentanyl is favored in patients with any type of end-organ failure. It also produces minimal hemodynamic effects, which adds to its appeal in patients with unstable blood pressure (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

In addition to patient characteristics, the pharmacokinetics of the opioid and the goals of treatment are considered when deciding which opioid is best for titration in a particular patient (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Whereas morphine, which is hydrophilic, requires several minutes (15–30) to cross the blood–brain barrier and yield peak effects after IV administration, the more lipophilic opioids, such as fentanyl, cross very quickly and produce peak effects almost immediately when given intravenously. Hydromorphone is less hydrophilic than morphine and so has an intermediate onset (see **Table 5-2**). Fentanyl tends to be a first-choice opioid for procedural pain and is a logical selection in ambulatory surgery PACU where the goal is to transition the patient quickly to the oral analgesic that the patient will take after discharge. For patients who have undergone major surgery, some PACU nurses like to administer a few doses of fentanyl and then follow with either hydromorphone or morphine for longer-lasting analgesia. However, although it makes sense to use a fast-onset opioid such as fentanyl in patients presenting with severe, escalating pain, it may not be necessary and can complicate the assessment process in those with less severe pain; when opioids are combined and adverse effects occur it is difficult to interpret which one might be the culprit. Therefore, a general principle of initial titration in patients with acute pain is to keep in mind the patients' ongoing pain treatment plan. As an example, consider the patient who is admitted to the PACU and will have hydromorphone IV patient-controlled analgesia (PCA) for ongoing postoperative pain management. Unless the patient has severe, rapidly escalating pain on admission, it makes sense to begin titration with hydromorphone so that the effects (both pain relief and adverse effects) of the drug that will be used by PCA can be evaluated more easily.

17. What is the correct way to titrate IV opioid analgesics?

Considerable variation exists in the amount of opioid individuals require for comfort (APS, 2008). For example, research has established that as much as a tenfold difference exists among patients in opioid requirements during the postoperative period (Myles, 2004). At all times, nurses must strive to achieve a balance between pain relief and adverse

effects (Pasero, 2010a). The goal of titration is to use the smallest dose that provides satisfactory analgesia with the fewest adverse effects (Pasero, 2010a; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

In opioid-naïve patients with moderate to severe pain, recommended starting IV doses are given (e.g., 2–3 mg of morphine, 0.4 mg of hydromorphone, or 25–50 mcg of fentanyl) (APS, 2008). When an increase in the opioid dose is necessary and safe, many clinicians increase by percentages. When a slight improvement in analgesia is needed, a 25% increase in the opioid dose may be sufficient; for a moderate effect, a 50% increase; and for a strong effect, such as for the treatment of continued severe pain, a 100% increase may be indicated (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). The time that the dose should be increased is determined by considering the peak effect of the opioid. The frequency of IV opioid doses during initial titration may be as often as every 5 to 15 minutes (see Table 5-2). The patient must be observed closely for adverse effects (Aubrun, Monsel, Langeron, Coriat, & Riou, 2002; Lvovschi et al., 2008). Conservative initial opioid doses along with careful monitoring during titration are recommended in the older adult population (APS, 2008; Keïta, Tubach, Maalouli, Desmonts, & Mantz, 2008; Pasero, 2010a; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011); however, doses should be increased based on patient response rather than a specific age.

Doses should not be increased in patients who are excessively sedated (e.g., unable to keep eyes open and falling asleep mid-sentence) (Pasero, 2009b). In such cases, nonopioid analgesics should be added or increased (e.g., full doses of an NSAID and acetaminophen). As noted, it may not be possible to achieve optimal pain control in the PACU for all patients; the process is viewed as occurring on a continuum (Pasero, 2009a; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Ensuring safe pain management is a primary objective.

18. Is there a predictable relationship between pain intensity and opioid dose requirement?

Research has shown that the relationship between pain intensity scores and dose requirements during and after titration in postoperative patients is not linear, suggesting that many factors influence pain and its relief, and that there is no specific dose that will relieve pain of a specific intensity (Aubrun & Riou, 2004; Pasero, 2014; Pasero, Quinlan-Colwell, Rae, Broglio, & Drew, 2016). Research underscores the importance of individualized selection of analgesic doses and systematic assessment of response during titration (Aubrun et al., 2003). Dosing to a specific pain intensity (e.g., set orders that mandate 2 mg of IV morphine for pain ratings of 1–3 on a scale of 0–10; 4 mg for pain ratings of 4–6; and 6 mg for pain ratings of 7–10) can be very dangerous and is strongly discouraged (Pasero, 2014; Pasero, Quinlan-Colwell, Rae, Broglio, & Drew, 2016; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011; Vila et al., 2005). Many factors, such as sedation level, respiratory status, and previous analgesic and sedative intake, in addition to pain intensity must be considered when selecting an opioid dose (Pasero, 2014; Pasero, Quinlan-Colwell, Rae, Broglio, & Drew, 2016).

19. Why are anticonvulsants used to treat postoperative pain?

Anticonvulsants are added to multimodal pain treatment plans to improve postoperative analgesia and prevent persistent neuropathic postsurgical pain; for example, following thoracotomy, mastectomy, hernia repair, limb amputation, abdominal hysterectomy, and cholecystectomy (Brogly et al., 2008; Buvanendran et al., 2010; Ho, Gan, & Habib, 2006; Pasero, 2011; Tiippana, Hamunen, Kontinen, & Kalso, 2007). In addition, as part of a multimodal treatment plan, anticonvulsants can reduce opioid and nonopioid dose requirements and related adverse effects (Azer, Abdelhalim, & Elsayed, 2006; Gilron, 2006; Hurley, Cohen, Williams, Rowlingson, & Wu, 2006; Murcia Sanchez, Orts Castro, Perez Doblado, & Perez-Cerda, 2006; Peng, Wijeysundera, & Li, 2007; Seib & Paul, 2006).

20. Is the rectal route an acceptable route for analgesic administration in the perioperative setting?

The rectal route for analgesic administration has a long history of safety in children undergoing surgery and is an alternative when oral or parenteral analgesics are not an option in patients of any age (Pasero, 2010b). Although all of the first-line opioids can be given intravenously, there are currently only three IV nonopioid analgesic formulations available in the United States: acetaminophen, ketorolac, and ibuprofen (IV indomethacin is used primarily for closure of patent ductus arteriosus). Postoperative nausea and vomiting and NPO status limit the usefulness of the oral route of administration in many patients.

Although the rectal route is not a first-line route of administration, when parenteral and oral nonopioids are not options, the use of the rectal route to

administer nonopioids should be considered. Studies have shown improved pain relief and reductions in opioid consumption with rectal nonopioid analgesics alone (Achariyapota & Titapant, 2008; Bahar, Jangjoo, Soltani, Armand, & Mozaffari, 2010). Other studies have demonstrated effective pain control with combinations of rectal acetaminophen and various NSAIDs or other analgesics (Bannwarth & Pehourcq, 2003; Carli et al., 2002; Ng, Swami, Smith, & Emembolu, 2008; Romsing, Møiniche, & Dahl, 2002).

21. What are the patient selection criteria for using patient-controlled analgesia?

A number of factors need to be considered in determining whether a patient is a candidate for PCA therapy. The most important factor is that the patient must be able to understand the relationships between pain, pushing the PCA button, and pain relief (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). When PCA is warranted, patients should be carefully screened for their cognitive and physical ability to manage their pain by that method. Clinicians often hesitate to prescribe PCA for children, believing that they are too young to understand the concept of PCA and how to use the pump appropriately. However, PCA has been used effectively and safely in developmentally normal children as young as 4 years old (Wellington & Chia, 2009). Intravenous PCA has been shown for many years to be safe in older patients (Gagliese, Gauthier, Macpherson, Jovellanos, & Chan, 2008), but providers often do not prescribe it for fear of producing confusion in these patients. Although the opioid (by whatever approach it is delivered) can contribute to confusion, the factors that may be responsible for postoperative confusion are numerous (Bagri, Rico, & Ruiz, 2008; Redelmeier, 2007; Sharma et al., 2005; Zakriya et al., 2002), and its development should not be assumed to be related to either the drug or the delivery approach. For example, the presence of postoperative pain and increased intensity of postoperative pain have been found to be independent predictors of postoperative delirium (Vaurio, Sands, Wang, Mullen, & Leung, 2006).

22. Should IV PCA therapy be initiated in the PACU?

When IV PCA is prescribed for postoperative patients, it should be initiated whenever possible in the PACU. This allows the healthcare team to evaluate patient response to the therapy early in the postoperative course and prevents delays in analgesia (analgesic gaps) on the clinical nursing unit (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). A particularly dangerous scenario to avoid is that of patients receiving IM opioid injections on the clinical unit while waiting for IV PCA to be initiated.

The PCA button should be given to patients as soon as they are awake and alert enough to understand the intent and use of the PCA. At that time, pain management plans can be reviewed with patients, including what action to take when pain relief is inadequate. PACU nurses can reinforce the safety mechanisms of the PCA pump and how to correctly use the PCA button, reminding patients that it is for their use only.

23. What methods are used to administer intraspinal (epidural, intrathecal) analgesia?

The three methods for administering intraspinal analgesia are: (1) bolus (administered by the clinician), (2) continuous infusion or basal rate (administered by a pump), and (3) patient-controlled epidural analgesia (PCEA) (administered by the patient using a pump).

For some surgical procedures, a single intraspinal morphine bolus provides sufficient pain control for several hours. For example, an epidural or intrathecal bolus of morphine often is administered to manage pain that does not warrant the placement of a catheter, such as after cesarean section and some gynecologic, orthopedic, and urologic procedures (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). A single epidural morphine dose is capable of providing analgesia for 24 to 48 hours depending on the formulation used. Single bolusing is also used when indwelling epidural catheters are contraindicated, such as in some patients who require anticoagulant therapy (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

Analgesic infusion pumps are used to deliver continuous epidural analgesic infusions (basal rate). Supplemental bolus doses are prescribed for breakthrough pain and can be administered using the clinician-administered bolus mode available on most infusion pumps.

Patient-controlled epidural analgesia permits patients to treat their pain by self-administering doses of epidural analgesics to meet their individual analgesic requirements. When PCEA is administered, a basal rate usually provides most of the patient's analgesic requirement and the PCEA bolus doses are used to manage breakthrough pain. If a basal rate is not provided, it is especially important to remind patients to "stay on top of the pain" by maintaining a steady neuraxial analgesic level and self-administering bolus doses before the pain is

severe and out of control (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

24. What is extended-release epidural morphine?

Extended-release epidural morphine (EREM; DepoDur) is distinguished from conventional epidural morphine (e.g., Astramorph, Duramorph) by its unique delivery system called DepoFoam, which consists of multiple microscopic, liposomal particles (Pasero & McCaffery, 2005b; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). The liposomes contain aqueous chambers that encapsulate preservative-free morphine (Carvalho et al., 2005). After an epidural injection, the liposomes slowly release morphine over a period of 48 hours by erosion or reorganization of the lipid membranes (Heitz & Viscusi, 2009). Primary advantages of this formulation are that it allows up to 48 hours of pain relief without the use of an indwelling catheter, which can pose a risk of infection, impede mobility, and raise concerns about postoperative anticoagulant therapy (Pasero & McCaffery, 2005b; Viscusi et al., 2005). Further, problems with infusion device programming errors are eliminated with this approach.

25. What is a continuous peripheral nerve block?

A continuous peripheral nerve block (also called perineural regional analgesia) involves the establishment of an initial local anesthetic block, followed by the placement of a catheter through which an infusion of local anesthetic is administered continuously, with or without PCA capability (Pasero, Polomano, Portenoy, & McCaffery, 2011). When PCA capability is added, this is referred to as patient-controlled regional analgesia (PCRA). Supplemental opioid or nonopioid–opioid analgesia is provided for breakthrough pain when continuous infusion only is used. In the acute pain setting, the therapy typically is continued during the first 24 to 72 hours postoperatively, depending on the type of surgery. Recent advances in operator skill, catheters, and infusion devices made specifically for continuous peripheral nerve block have resulted in the widespread use of this technique for a variety of types of pain, particularly surgical pain, in both inpatient and outpatient settings.

26. What is a continuous local anesthetic wound infusion?

Continuous local anesthetic wound infusions involve the surgeon's placement of a catheter subcutaneously into the surgical wound at the end of the surgical procedure to be used for continuous infusion of local anesthetics, such as bupivacaine or ropivacaine, to control postoperative pain (Pasero, Polomano, Portenoy, & McCaffery, 2011). Just as with continuous peripheral nerve blocks, supplemental IV or oral analgesics should be provided in addition to this therapy.

27. How should the effectiveness of the pain treatment plan be evaluated?

Systematic reassessment is essential to determine the effectiveness and safety of the pain treatment plan. The pain rating scale is the primary tool used in the postoperative setting to evaluate effectiveness, allowing nurses to compare the intensity of pain before and after analgesic interventions. The frequency with which pain ratings are obtained depends on the situation. Guidelines recommend that, at a minimum, pain should be assessed during the initial encounter and then reassessed and documented at regular intervals after a management plan is initiated, with each new report of pain and at an appropriate interval after intervention (APS, 2008; McCaffery, Herr, & Pasero, 2011). For example, pain ratings every 5 to 15 minutes may be appropriate during IV opioid titration for severe pain in the PACU.

Reassessment also includes evaluating patients for the presence and severity of adverse effects from pain treatment interventions and determining the need to treat adverse effects or perhaps change the pain management plan (Jarzyna et al., 2011; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Patient safety is a primary concern. In all cases, adjustments in the treatment plan are individualized according to the patient response (both to pain relief *and* adverse effects).

28. What should be done if the pain treatment plan is not effective?

As the patient's primary pain manager, the nurse is responsible for advocating for changes to the treatment plan when what has been prescribed is not effective or if treatment results in unmanageable and intolerable adverse effects or the potential for such. For example, to prevent clinically significant opioid-induced respiratory depression, the nurse must advocate for the establishment of a strong nonopioid foundation or adding or increasing the dose of nonopioid analgesics (acetaminophen or an NSAID) rather than administering increased opioid doses to a patient who is both excessively sedated and in severe pain (Jarzyna et al., 2011; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

29. What is the relationship between anxiety and pain, and how are they differentiated and treated?

When the physical cause of pain is unknown or seems insufficient to account for the severity of pain that the patient reports, clinicians sometimes attribute the pain to the patient's emotional state and cease treating it. However, evidence that anxiety increases pain is limited, and a cause and effect relationship is unclear (McCaffery, Herr, & Pasero, 2011). It is difficult to know if anxiety causes pain or if anxiety is the result of pain. The belief that anxiety causes pain is reflected in the common practice of combining anxiolytics and opioids, but a major problem with the administration of benzodiazepines in the perioperative period is that they increase the risk of sedation and respiratory depression and the dose of opioid that may be safely administered to the patient to relieve pain must be limited (APS, 2008).

There is no doubt that pain results in considerable distress for many patients. Until the relationship between pain and anxiety is clarified, the most practical initial approach to patients who are both in pain and anxious is to assume that pain causes this emotional response rather than to assume that the emotional response causes or intensifies pain (McCaffery, Herr, & Pasero, 2011). Anxiety appears to be a normal response to pain. When the patient is both in pain and anxious, initial interventions should be aimed at reducing the pain. Analgesic titration should precede treatment with benzodiazepines in anxious patients with pain. Pain relief may well reduce the anxiety and avoid the need for a benzodiazepine and the potential for increased sedation (McCaffery, Herr, & Pasero, 2011).

30. What is the difference between an opioid-tolerant patient and one who is opioid-naïve?

The terms *opioid-tolerant* and *opioid-naïve* are used to distinguish between patients who have, or have not, respectively, been taking opioid drugs regularly. An opioid-tolerant person has taken opioids long enough at doses high enough to develop tolerance to many of the effects of an opioid, including analgesia and sedation (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). There is great variation among individuals, however, with some not developing tolerance at all (Webster & Dove, 2007). Therefore, it is difficult to determine if and when an individual on regular doses of opioids has become tolerant. Consequently, there is no widely accepted definition for classifying a patient as opioid-tolerant (Patanwala, Jarzyna, Miller, & Erstad, 2008). By convention, many clinicians consider a patient who has used opioids regularly for approximately 7 days or more to be opioid-tolerant (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

31. What is the difference between opioid addiction, physical dependence, and tolerance?

The terms *physical dependence* and *tolerance* often are confused with addiction, so clarification of terms is important (McCaffery, Herr, & Pasero, 2011). The definitions proposed in a 2001 consensus statement by the American Academy of Pain Medicine (AAPM), the American Pain Society, and the American Society of Addiction Medicine (ASAM) are as follows:

- *Physical dependence* is a normal response that occurs with repeated administration of an opioid for more than 2 weeks and cannot be equated with addictive disease. It is manifested by the occurrence of withdrawal symptoms when the opioid is suddenly stopped or rapidly reduced or an antagonist such as naloxone is given. Withdrawal symptoms may be suppressed by the natural, gradual reduction of the opioid as pain decreases or by gradual, systematic reduction, referred to as tapering (ASAM, 2001).
- *Tolerance* is also a normal response that occurs with regular administration of an opioid and consists of a decrease in one or more effects of the opioid (e.g., decreased analgesia, sedation, or respiratory depression). It cannot be equated with addictive disease. Tolerance to analgesia usually occurs in the first days to 2 weeks of opioid therapy but is uncommon after that. It may be treated with increases in dose. However, disease progression, not tolerance to analgesia, appears to be the reason for most dose escalations. Stable pain usually results in stable doses. Thus, tolerance poses very few clinical problems (ASAM, 2001).
- *Opioid addiction,* or addictive disease, is a chronic neurologic and biologic disease. Its development and manifestations are influenced by genetic, psychosocial, and environmental factors. No single cause of addiction, such as taking an opioid for pain relief, has been found. It is characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and craving (ASAM, 2001).

The consensus statement reinforces an important message—that taking opioids for pain relief is not addiction, no matter how long a person takes opioids or at what doses (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Individuals taking opioid drugs for relief of pain are using them therapeutically.

32. What is pseudo-addiction?

Pseudo-addiction, as the name implies, is a mistaken diagnosis of addictive disease. The term was first used and the behaviors described in a case report by Weissman and Haddox (1989). When a patient's pain is not well controlled, the patient may begin to manifest symptoms suggestive of addictive disease. In an effort to obtain adequate pain relief, the patient may respond with demanding behavior, escalating demands for more or different medications, repeated requests for opioids on time or before the prescribed interval between doses has elapsed, and frequent visits to the emergency department. As an example, patients who receive opioid doses that are too low or at intervals greater than the opioid's duration of action may understandably try to manipulate the staff into giving them more analgesic. Pain relief typically eliminates these behaviors and is often accomplished by increasing opioid doses, decreasing intervals between doses, or providing an extra prescription in case it is needed.

33. What is the risk of opioid addiction when opioids are taken for pain relief?

The incidence of addiction as a result of taking an opioid for therapeutic reasons, such as postoperative pain management, is thought to be quite rare (Jackson, 2009). Research on long-term opioid use is limited (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). An evidence-based review of all available studies on the development of addiction and aberrant drug-related behaviors in patients with persistent noncancer pain being treated with opioids calculated the percentage of abuse and/or addiction following opioid therapy to be 0.19% (Fishbain, Cole, Lewis, Rosomoff, & Rosomoff, 2008). These data are reassuring, suggesting that patients with no past or present history of abuse or addiction usually remain responsible medication users over time. Similarly, a registry study of patients who were treated with modified-release oxycodone and followed for up to 3 years after participating in a clinical trial also showed a very low occurrence of problematic drug-related behavior—of the 227 patients studied, there were just six cases of misuse and no cases of new addiction (Portenoy et al., 2007).

34. What can be done to improve pain management in the postoperative patient with underlying persistent (chronic) pain?

A general principle of perioperative care is to optimize the patient's condition, including the management of persistent pain, prior to a surgical procedure (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). If preexisting pain is poorly controlled preoperatively, the primary care provider or anesthesiologist should be contacted for appropriate orders.

A multimodal postoperative pain treatment plan, initiated preoperatively whenever possible, is essential in patients with underlying persistent pain. The American Society of Anesthesiologists (2012) recommends the continuation of opioid analgesics to prevent opioid withdrawal syndrome in patients who take them preoperatively for preexistent pain. Other clinicians provide similar recommendations (Ashraf, Wong, Ronayne, & Williams, 2004; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). It is important to remember that patients who have been taking opioids on a long-term basis preoperatively are likely to be opioid tolerant and may require higher postoperative opioid doses than opioid-naïve patients. Although most of the nonselective NSAIDs (e.g., ibuprofen, naproxen) should be discontinued prior to surgery if bleeding is a concern, some nonselective NSAIDs (nabumetone, meloxicam, choline magnesium trisalicylate, magnesium salicylate, and salsalate) and the COX-2 selective NSAID celecoxib have no effect on bleeding time and may be continued throughout the perioperative period (Ashraf, Wong, Ronayne, & Williams, 2004). Intravenous or oral acetaminophen, as part of a nonopioid foundation, can be added as well (Pasero & Stannard, 2010). Anticonvulsants and antidepressants, which are often administered for treatment of persistent neuropathic pain, should also be continued if taken preoperatively or added to the treatment plan if not taken preoperatively.

35. What can be done to improve the pain experience for the opioid-tolerant patient undergoing surgery?

Clinicians unfamiliar with caring for opioid-tolerant patients are likely to be fearful of the high doses often required by patients who are opioid tolerant, and as a result, the patient may be underdosed. Tolerance to the adverse effects of opioids develops more rapidly than to analgesia, meaning

that opioids may be safely titrated to relatively high doses to provide adequate analgesia (Mehta & Langford, 2006). It is important for clinicians to appreciate that although opioid tolerant patients may require higher opioid doses than opioid naïve patients, they are not immune to opioid-induced respiratory depression. All patients are at risk for this adverse event (Jarzyna et al., 2011).

Unfortunately, there are no evidence-based guidelines for predicting postoperative opioid requirements on the basis of the opioid dose consumed before surgery. One suggestion is to expect opioid requirements postoperatively in the opioid-tolerant patient to be two to four times the dose required in an opioid-naïve person (Carroll, Angst, & Clark, 2004). One prospective study showed opioid tolerant patients required nearly seven times more opioid than opioid naïve patients (Patanwala, Jarzyna, Miller, & Erstad, 2008); however, individualization of care is essential to ensure effective pain control and patient safety (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Multidisciplinary and multi-faceted approaches to overcome barriers to the provision of the best possible pain relief for opioid tolerant patients have been shown to be effective (Doi, Shimoda, & Gibbons, 2014; Dykstra, 2012).

36. How should postoperative pain be treated in a patient with addictive disease?

Opioids, if they are appropriate, should not be withheld from patients with pain who also have addictive disease (May, White, Leonard-White, Warltier, & Pagel, 2001; Mitra & Sinatra, 2004; Oliver et al., 2012). The acute setting is not the optimal time to attempt detoxification or rehabilitation of a patient who is abusing opioids or other substances (Mitra & Sinatra, 2004). Clinicians often fear that by providing opioids for pain they are feeding the addiction; however, no research shows that providing opioid analgesics to a person with addictive disease will worsen the disease. Conversely, there is no research to show that withholding opioid analgesics when needed will increase the likelihood of recovery (Compton, 1999). In fact, withholding opioids in this situation may cause significant pain, increasing the patient's level of stress, and may lead to increased craving for drugs of abuse. The patient may make efforts to obtain the drug that has been abused, or a patient in recovery may relapse. In the inpatient setting, the patient may make efforts to bring in illicit drugs. Clearly, on many levels, providing pain relief to the patient with addictive disease, even when it includes opioids, is preferable to withholding opioids (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011).

An excellent resource for pain management in the patient with pain and addictive disease was developed by the American Society for Pain Management Nursing: ASPMN Position Statement: Pain Management in Patients with Substance Use Disorders (Oliver et al., 2012) available at http://www.aspmn.org. It covers patients actively abusing substances, patients in recovery, and those receiving medical management for opioid addictive disease. The ASPMN paper states that "every patient with pain, including those with substance abuse disorders, has the right to be treated with dignity, respect, and high-quality pain assessment and management" (Oliver et al., 2012, p. 169).

37. What are the most common adverse effects of NSAIDs in the perioperative setting and what approaches are used to minimize and manage them?

The most common adverse effects of NSAIDs involve the GI system. NSAID-induced GI toxicity usually is addressed in the literature as an adverse effect resulting from long-term NSAID use; however, GI ulceration can occur with short-term perioperative administration as well (Pasero, Portenoy, & McCaffery, 2011). This is particularly true in individuals with elevated risk for GI toxicity, such as older adults and those with a previous GI complication. The use of the least ulcerogenic nonselective NSAID or a COX-2 selective NSAID, if not contraindicated by cardiovascular risk, is encouraged. The lowest effective NSAID dose for the shortest period of time necessary is also recommended (Pasero, Portenoy, & McCaffery, 2011).

The possibility of increased bleeding time is of special concern when NSAIDs are used for postoperative pain. Aspirin has an irreversible effect on platelets and will increase bleeding time for up to 7 days after the last dose (i.e., until the damaged platelets are replaced by new ones). For that reason, aspirin therapy is usually discontinued 1 week or more before surgery, and aspirin is not recommended for perioperative analgesic use (Ashraf, Wong, Ronayne, & Williams, 2004). Other nonselective NSAIDs are also sometimes withheld during the perioperative period because of their tendency to prolong bleeding time. However, acetaminophen; the nonselective NSAIDs nabumetone, meloxicam, choline magnesium trisalicylate, magnesium salicylate, and salsalate; and the COX-2 selective NSAID celecoxib have no effect on bleeding

time and should be considered instead (Visser & Goucke, 2008).

Shortly after the release of the COX-2 selective NSAIDs, studies revealed an association between the perioperative use of valdecoxib and an increase in adverse cardiovascular events (e.g., myocardial infarction, stroke, pulmonary embolism) in patients who had undergone high-risk cardiac surgery (Nussmeier et al., 2005; Ott et al., 2003). The general recommendation is to avoid the perioperative use of NSAIDs following high-risk, open heart surgery (United States Food and Drug Administration [USFDA], 2007).

Adverse renal effects are relatively rare in otherwise healthy individuals who are given NSAIDs during the perioperative period (Lee, Cooper, Craig, Knight, & Keneally, 2007). In contrast, individuals with acute or chronic volume depletion or hypotension depend on prostaglandin synthesis to maintain adequate renal blood flow ("prostaglandin dependence") (Helstrom & Rosow, 2006), and NSAID inhibition of prostaglandin synthesis in such patients can cause acute renal ischemia and acute renal failure (ARF) (Helstrom & Rosow, 2006). Acute renal failure as a result of hypovolemia is usually reversed when the NSAID is stopped and volume is replenished (Miyoshi, 2001), but it underscores the importance of adequate hydration and maintenance of acceptable BP before and during NSAID administration. Patients at increased risk for perioperative ARF and who might be more susceptible to NSAID-induced renal injury include those with cardiac failure, liver cirrhosis, ascites, diabetes, preexisting hypertension, and patients being treated with ACE inhibitors (Forrest et al., 2002; Helstrom & Rosow, 2006; Launay-Vacher, Karie, Fau, Izzedine, & Deray, 2005). Other risk factors are preexisting renal impairment, advanced age, and left ventricular dysfunction (Helstrom & Rosow, 2006). It is generally recommended that NSAIDs be avoided in patients with chronic renal failure and in any patient with a creatinine clearance below 30 mL/min (Laine, White, Rostom, & Hochberg, 2008; Launay-Vacher, Karie, Fau, Izzedine, & Deray, 2005). Acetaminophen and opioids (e.g., fentanyl) are better choices in these patients.

38. What are the adverse effects of local anesthetics?

The use of local anesthetics for postoperative pain is most often in combination with opioids for epidural analgesia or alone for continuous peripheral nerve block (Pasero, Polomono, Portenoy, & McCaffery, 2011). The doses of local anesthetic used for these methods rarely result in blood concentrations sufficient to cause systemic effects. However, vascular uptake or injection or infusion of local anesthetic directly into the systemic circulation can result in adverse reactions related to high blood levels of local anesthetic, although there are reports of no adverse effects following accidental IV infusion of epidural doses of local anesthetics (Allegri et al., 2009). Central nervous system signs of systemic toxicity include ringing in ears, metallic taste, slow speech, confusion, irritability, twitching, and seizures. Signs of cardiotoxicity include circumoral tingling and numbness, bradycardia, cardiac dysrhythmias, acidosis, and cardiovascular collapse (Pasero, Polomono, Portenoy, & McCaffery, 2011). Patients receiving local anesthetics should be evaluated systematically for these signs, and those who receive continuous peripheral nerve block in the home setting must be given verbal and written instructions that include the signs and symptoms of adverse effects, and what to do if detected (Pasero, Eksterowicz, Primeau, & Crowley, 2007).

39. What are the most common adverse effects of opioid analgesics in the perioperative setting and what approaches are used to minimize and manage them?

The most common opioid adverse effects are postoperative nausea and vomiting (PONV), pruritus, hypotension, and sedation. Respiratory depression is less common but is the most feared of the opioid adverse effects. The adverse effects of opioids are dose dependent. Thus, the single most effective, safest, and least expensive treatment is to give the lowest effective opioid dose (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Decreasing the opioid dose is facilitated by adding or increasing the dose of a nonopioid, such as an NSAID or acetaminophen, and using local anesthetics for peripheral nerve blocks or adding a local anesthetic to the epidural opioid solution to provide additional pain relief.

Consensus guidelines present a number of recommendations for the management of PONV (Gan et al., 2007, 2014). Algorithms that incorporate guideline recommendations are available (American Society of PeriAnesthesia Nurses [ASPAN], 2006; Gan et al., 2007, 2014). Key points are to identify patients at high risk for PONV (e.g., females, those with a prior history of motion sickness or PONV, nonsmokers, emetogenic surgery, and those who use postoperative opioids); reduce

baseline risk factors (e.g., implement multimodal analgesic strategies); and administer PONV prophylaxis for patients with a moderate-to-high risk. Prophylactic antiemetic treatment is not recommended in low-risk patients; however, antiemetic treatment is provided in those who develop PONV and did not receive prophylaxis or in whom prophylaxis failed (Gan et al., 2007, 2014).

Pruritus (itching) is an adverse effect, not an allergic reaction to opioids (Ho & Gan, 2009). A number of treatments are used in an effort to relieve itching, and there is no consensus on which method is most effective. Although they are widely used, there is no strong evidence that antihistamines, such as diphenhydramine (Benadryl), relieve opioid-induced pruritus (Grape & Schug, 2008). Patients may report being less bothered by itching after taking an antihistamine, but this is likely the result of sedating effects (Ho & Gan, 2009). Sedation can be problematic in those already at risk for excessive sedation, such as postoperative patients, as this can lead to life-threatening respiratory depression (Anwari & Iqbal, 2003). Thus, careful monitoring of sedation levels is recommended when antihistamines are combined with opioid administration, and they should not be administered if patients are excessively sedated.

Opioid antagonists (e.g., naloxone [Narcan]) and agonist-antagonists (e.g., nalbuphine [Nubain]) are sometimes used to treat pruritus; however, this practice risks reversal of analgesia if the administered doses are too high. Pain must be monitored closely when opioid antagonists are used. Numerous studies have shown that serotonin receptor antagonists, such as ondansetron, dolasetron, and granisetron, prevent pruritus caused by intraspinal opioids (Charuluxananan, Somboonviboon, Kyokong, & Nimcharoendee, 2000; Gurkan & Toker, 2002; Henry, Tetzlaff, & Steckner, 2002; Iatrou et al., 2005; Pirat, Tuncay, Torgay, Candan, & Arslan, 2005). A common clinical observation is that postoperative patients with opioid-induced pruritus also have well-controlled pain, tolerate a small reduction in opioid dose without any loss of analgesia, and experience a significant reduction or resolution of their pruritus (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). This should be considered prior to or in conjunction with pharmacologic treatment.

Although the opioid doses commonly used for pain management rarely cause hypotension (Ho & Gan, 2009; Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011), when it does occur, it is more likely to be in individuals with high sympathetic tone, such as those with pain or poor cardiac function, or in patients who are hypovolemic. In fact, addressing pain is important because pain may contribute to hemodynamic instability. In other words, opioids should not be withheld for fear of causing hypotension. When hypotension is a concern, it can be minimized by administering the opioid slowly, keeping the patient supine, and optimizing intravascular volume (Harris & Kotob, 2006; Ho & Gan, 2009). Therapy can begin with a small dose while closely observing patient response. Administration of opioids via slow IV infusion may be appropriate in some patients (Harris & Kotob, 2006).

40. Are there any long-term adverse effects of opioid analgesics?

Surprisingly, little is known about the long-term effects of opioid analgesics; most of the literature that exists discusses the effects of chronic opioid use in individuals with persistent pain (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). The effect of opioids on immune function has been studied in animals and in humans in the absence of pain and has been found to suppress immune function; however, in the presence of acute pain, opioid administration in analgesic doses seems to be protective (Page, 2005). Much less is known about the effect on the immune system of prolonged opioid administration in the presence of persistent pain. It is well known that pain itself suppresses immune function; opioids in analgesic doses could provide relief of pain and thereby provide some relief of the immune suppression of pain (Page, 2005).

Negative effects of opioids on the endocrine system have been known for years, but little has been written about this (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Most of the literature concerns opioid-induced hypogonadism, which is probably common in both male and female patients on long-term opioid therapy (Katz & Mazer, 2009). No standards for laboratory monitoring exist, but recommendations include testing for total and free testosterone (especially in men) and monitoring bone density. Symptoms include decreased libido, erectile dysfunction in men, depression, anxiety, and fatigue. Of course, these symptoms may be due to many other causes, such as pain itself. Treatment considerations include opioid rotation (switching to another opioid) and testosterone supplementation. Based on available information, it is not reasonable to withhold opioid therapy because of concerns about endocrine effects of long-term opioid use. These can be monitored and treated.

41. How should sedation be assessed during opioid administration?

The observation that excessive sedation precedes opioid-induced respiratory depression (Abou Hammoud et al., 2009) indicates that systematic sedation assessment is an essential aspect of the care of opioid-naïve patients receiving opioid therapy (Jarzyna et al., 2011; Nisbet & Mooney-Cotter, 2009; Pasero, 2009b, 2013). The importance of monitoring sedation to prevent clinically significant respiratory depression cannot be overemphasized. The American Society for PeriAnesthesia Nurses issued three major practice recommendations surrounding sedation assessment in the perioperative setting: 1) assess and screen patients for individual and iatrogenic risk; 2) assess for unwanted sedation in Phase I and Phase II PACU; and 3) perform an individualized discharge assessment of inpatient postoperative patients (ASPAN, 2014).

Nursing assessment of opioid-induced sedation is convenient, inexpensive, and takes minimal time to perform (Pasero, 2009b). PACU nurses often use scoring systems (e.g., Aldrete) that include level of consciousness to determine readiness for discharge; however, a simple, easy-to-understand sedation scale that includes what should be done at each level of sedation should be used for ongoing assessment of opioid-induced sedation after the patient has been transferred to the clinical unit. The use of such a scale will help to enhance accuracy and consistency of assessment and treatment, will help to monitor trends, and will help to communicate effectively between members of the healthcare team (Kobelt, 2014; Kobelt, Burke, & Renker, 2013). A commonly used sedation scale in PACUs and clinical units is the Pasero Opioid-Induced Sedation Scale (POSS) (**Box 5-1**) (ASPAN, 2014; Kobelt, 2014; Kobelt, Burke, & Renker, 2013). Note that the POSS links nursing interventions to the various levels of sedation. Research has shown that nurses find this approach helpful in making the appropriate decisions on how to proceed with opioid treatment (Nisbet &Mooney-Cotter, 2009; Kobelt, 2014).

BOX 5-1. Pasero Opioid-Induced Sedation Scale (POSS) with Interventions[1]

S = Sleep, easy to arouse
Acceptable; no action necessary; may increase opioid dose if needed.
1 = Awake and alert
Acceptable; no action necessary; may increase opioid dose if needed.
2 = Slightly drowsy, easily aroused
Acceptable; no action necessary; may increase opioid dose if needed.
3 = Frequently drowsy, arousable, drifts off to sleep during conversation

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 25–50%[2] or notify primary[3] 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 15–30 minutes.

4 = Somnolent, minimal or no response to verbal and physical stimulation

Unacceptable; stop opioid; consider administering naloxone[4,5]; call Rapid Response Team (Code Blue); stay with patient, stimulate, and support respiration as indicated by patient status; notify primary[3] or anesthesia provider; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory.

[1]Copyright 1994, Chris Pasero. Used with permission. Reliability and validity information for the POSS can be found in Nisbet & Mooney-Cotter, 2009. [2]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. [3]For example, the physician, nurse practitioner, advanced practice nurse, or physician assistant responsible for the pain management prescription. [4]For adults experiencing respiratory depression, give dilute intravenous naloxone very slowly while observing the patient's response (titrate to effect). [5]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.

42. Does a patient's level of sedation correspond with pain relief?

The presence of sedation does not necessarily mean that patients are comfortable, and despite being excessively sedated, some patients will report pain (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). Further, sleep during opioid titration is not normal sleep but primarily the result of the sedative effects of the opioid (Paqueron et al., 2002). Opioid doses should *not* be increased (titration should be stopped) in patients who are excessively sedated. A multimodal approach that administers both acetaminophen and an NSAID preoperatively, or, at the latest, on admission to the PACU, will facilitate the management of pain in these high-risk and challenging patients.

43. How can clinically significant opioid-induced respiratory depression be prevented?

PeriAnesthesia nurses play a critical role in preventing opioid-related adverse events, such as excessive sedation and life-threatening respiratory depression (Pasero, 2013). Clinically significant opioid-induced respiratory depression can be prevented by careful opioid titration, close monitoring by the nurse of sedation and respiratory status, and opioid dose reduction if increasing sedation is detected (Pasero, 2009b). Opioid-induced sedation and respiratory depression are dose-related, suggesting that opioid orders and hospital protocols should include the expectation that nurses will stop titration or will promptly decrease the opioid dose whenever excessive sedation is detected, regardless of the level of pain relief. Patient safety is the primary consideration! Routine administration of nonsedating analgesics as part of a multimodal approach initiated preoperatively or as soon as the patient is started on opioid therapy is essential to help prevent excessive sedation from occurring later in the course of care (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011; Pasero, 2013). In all patients with elevated risk, starting opioid doses should be decreased 25–50%. Continuous mechanical monitoring (e.g., pulse oximetry or capnography [$ETCO_2$]) may also be indicated in some patients with high risk factors (**Box 5-2**).

44. What is the correct technique for administering naloxone to reverse opioid-induced respiratory depression?

If it is necessary to use naloxone to reverse clinically significant respiratory depression, it should be titrated very carefully (APS, 2008). Sometimes, more than one dose of naloxone is necessary because naloxone has a shorter duration (1 hour in most patients) than most opioids; however, giving too much naloxone or giving it too fast can precipitate severe pain that is extremely difficult to control and can increase sympathetic activity leading to hypertension, tachycardia, ventricular dysrhythmias, pulmonary edema, and cardiac arrest (Brimacombe, Archdeacon, Newell, & Martin, 1991; O'Malley-Dafner & Davies, 2000). Hospital protocols and opioid orders should include the expectation that nurses will administer naloxone in accordance with the American Pain Society (2008) recommendation to dilute 0.4 mg of naloxone in 10 mL saline and administer intravenously very slowly while observing patient response (titrate to effect) whenever a patient is found to have clinically significant opioid-induced respiratory depression. In physically dependent patients, withdrawal syndrome can be precipitated by naloxone administration; patients who have been receiving opioids for more than 1 week may be exquisitely sensitive to antagonists (APS, 2008).

45. What information about pain control should be included in handoff communication?

A comprehensive report about the patient's pain and measures that have been taken to get it under control in addition to the customary information about the patient's surgical procedure and general condition is essential to communicate when care is transferred from one nurse to another (Jarzyna et al., 2011). It is important to include the patient's individual and iatrogenic risk factors for respiratory depression (Box 5-2). For example, high opioid doses intraoperatively or in the PACU, a history of snoring or apnea, and prolonged surgery are significant risk factors and should be included in the report so that the nurse on the clinical unit can prepare for appropriate close monitoring of the patient (Jarzyna et al., 2011). It may be necessary, in some cases, to arrange transfer to a unit that can provide the needed monitoring if it is discovered that the intended clinical unit is unable to provide it.

Complete pain control on admission to the clinical unit for all patients is an unrealistic and dangerous expectation. All team members must appreciate that it may take time after transfer to the clinical unit to establish optimal pain control in patients who had severe pain on admission to the PACU; the primary objective is to provide both effective

BOX 5-2. Risk Factors for Opioid-Induced Respiratory Depression

Patient may have any one or more of the following to be considered high risk:

- Opioid naïvety (patients who have not been taking regular daily doses of opioids for several days).
- Older age (e.g., > 65 years[1]).
- Obesity (e.g., BMI > 35 kg/m^2).
- Obstructive sleep apnea (OSA).[2]
- History of snoring or witnessed apneas.[2]
- Excessive daytime sleepiness.[2]
- Preexisting pulmonary disease or dysfunction (e.g., chronic obstructive pulmonary disease [COPD]).
- Major organ failure.
- Smoker.
- American Society of Anesthesiologists (ASA) Patient Status Classification 3, 4, or 5 in surgical patients (level determined by anesthesia provider preoperatively).
  - Classification 3: A patient who has a severe systemic disease.
  - Classification 4: A patient with severe systemic disease that is a constant threat to life.
  - Classification 5: A moribund patient who is not expected to survive without the operation.
- Increased opioid dose requirement.
  - Opioid-naïve patients who require more than 10 mg morphine equivalent in a short period of time (e.g., in the PACU).[3,4]
  - Opioid-tolerant patients who are given a significant amount of opioid in addition to their usual amount, such as the patient who takes an opioid analgesic preoperatively for persistent pain and receives several IV opioid bolus doses in the PACU followed by high-dose IV PCA for ongoing acute postoperative pain.[4]
- Pain is controlled after a period of poor control.
- Prolonged surgery.
- Thoracic and other large incisions that may interfere with adequate ventilation.
- Concomitant administration of sedating agents, such as benzodiazepines, anxiolytics, or antihistamines.
- Large single bolus techniques (e.g., single-injection neuraxial morphine).
- Continuous opioid infusion in opioid-naïve patients (e.g., IV PCA with basal rate [background infusion]).
- Naloxone administration: Patients who are given naloxone for clinically significant respiratory depression are at risk for repeated respiratory depression; another dose of naloxone may be needed as early as 30 minutes after the first dose because the duration of naloxone is shorter than the duration of most opioids.

 From Opioid analgesics. In C. Pasero & M. McCaffery, *Pain assessment and pharmacologic management*. St. Louis, MO: Mosby. [1]There is no consensus on what age constitutes "older"; some cite it as over 65 years and others cite it as over 75 years. It is important to consider the patient's general health and condition in addition to age. [2]Most people with OSA do not know they have the condition; therefore, all patients and particularly their family members should be asked on admission if the patient snores or has apneic episodes during sleep or is excessively sleepy during the day. Other risk factors for OSA should be assessed as well (ASA, 2014). [3]Patients who require 20 mg or more of morphine are at very high risk for opioid-induced sedation and clinically significant respiratory depression (Abou Hammoud et al., 2009). [4]It is recommended that patients be watched closely for at least 3 hours past the peak concentration of the last opioid dose (APS, 2008).

and safe analgesia (Pasero, Quinn, Portenoy, McCaffery, & Rizos, 2011). The PACU nurse should inform the nurse assuming care of the patient on the clinical unit about the patient's pain rating goal, how close the patient is to achieving it, what has been done thus far to achieve it (e.g., analgesics, doses, and time of administration), and how well the patient has tolerated analgesic administration (adverse effects).

REFERENCES

Abou Hammoud, H., Simon, N., Urien, S., Riou, B., Lechat, P., & Aubrun, F. (2009). Intravenous morphine titration in immediate postoperative pain management: Population kinetic-pharmacodynamic and logistic regression analysis. *Pain*, *144*(1–2), 139–146.

Achariyapota, V., & Titapant, V. (2008). Relieving perineal pain after perineorrhaphy by diclofenac rectal suppositories: A randomized double-blinded placebo-controlled trial. *Journal of the Medical Association of Thailand*, *91*(6), 799–804.

Allegri, M., Baldi, C., Pitino, E., Cusato, M., Regazzi, M., & Braschi, A. (2009). An accidental intravenous infusion of ropivacaine without any adverse effects. *Journal of Clinical Anesthesia*, *21*(4), 312–313.

American Pain Society. (2008). *Principles of analgesic use in the treatment of acute pain and cancer pain* (6th ed.). Glenview, IL: American Pain Society.

American Pain Society. (2016). Guidelines on the management of postoperative pain. *Journal of Pain, 17*(2), 131–157.

Oliver, J., Coggins, C., Compton, P., Hagan, S., Matteliano, D., Stanton, M., ... Turner, H. N. (2012). American Society for Pain Management Nursing Statement: Pain management in patients with substance use disorders. *Pain Management Nursing*, 13(3), 169–183.

American Society of Addiction Medicine. (2001). Definitions related to the use of opioids for the treatment of pain: Consensus statement of the American Academy of Pain Medicine, the American Pain Society, and the American Society of Addiction Medicine. Retrieved from http://www.asam.org/docs/publicy-policy-statements/1opioid-definitions-consensus-2-011.pdf?sfvrsn=0

American Society of Anesthesiologists. (2012). Practice guidelines for acute pain management in the perioperative setting. *Anesthesiology*, *116*(2), 248–273.

American Society of Anesthesiologists. (2014). Practice guidelines for the perioperative management of patients with obstructive sleep apnea. *Anesthesiology*, *120*(2), 1–19.

American Society of PeriAnesthesia Nurses. (2006). ASPAN's evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNV. *Journal of Perianesthesia Nursing*, *21*(4), 230–250.

American Society of PeriAnesthesia Nurses. (2014). The ASPAN prevention of unwanted sedation in the adult patient evidence-based practice recommendation. *Journal of PeriAnesthesia Nursing, 29*(5), 344–353.

Anwari, J. S., & Iqbal, S. (2003). Antihistamines and potentiation of opioid induced sedation and respiratory depression. *Anaesthesia*, *58*(5), 494–495.

Arbour, C., & Gelinas, C. (2009). Are vital signs valid indicators of pain in postoperative cardiac surgery ICU adults? *Intensive & Critical Care Nursing*, *26*(2), 83–90.

Ashraf, W., Wong, D. T., Ronayne, M., & Williams, D. (2004). Guidelines for preoperative administration of patients' home medications. *Journal of Perianesthesia Nursing*, *19*(4), 228–233.

Aubrun, F., Langeron, O., Quesnel, C., Saillant, G., Coriat, P., & Riou, B. (2003). Relationships between measurement of pain using visual analog score and morphine requirements during postoperative intravenous morphine titration. *Anesthesiology*, *98*(6), 1415–1421.

Aubrun, F., Monsel, S., Langeron, O., Coriat, P., & Riou, B. (2002). Postoperative titration of intravenous morphine in the elderly patient. *Anesthesiology*, *96*(1), 17–23.

Aubrun, F., & Riou, B. (2004). In reply to correspondence. *Anesthesiology*, *100*(3), 745.

Azer, M. S., Abdelhalim, S. M., & Elsayed, G. G. (2006). Preemptive use of pregabalin in postamputation limb pain in cancer hospital: A randomized, double-blind, placebo-controlled, double dose study. *European Journal of Pain*, *10*(1), S98.

Bagri, A. S., Rico, A., & Ruiz, J. G. (2008). Evaluation and management of the elderly patient at risk for postoperative delirium. *Clinics in Geriatric Medicine*, *24*(4), 667–686.

Bahar, M. M., Jangjoo, A., Soltani, E., Armand, M., & Mozaffari, S. (2010). Effect of preoperative rectal indomethacin on postoperative pain reduction after open cholecystectomy. *Journal of Perianesthesia Nursing*, *25*(1), 3–6.

Bannwarth, B., & Pehourcq, F. (2003). Pharmacologic basis for using paracetamol: Pharmacokinetics and pharmacodynamic issues. *Drugs*, *63*(2), 5–13.

Blumstein, H. A., & Moore, D. (2003). Visual analog pain scores do not define desire for analgesia in patients with acute pain. *Academic Emergency Medicine*, *10*(3), 211–214.

Brimacombe, J., Archdeacon, J., Newell, S., & Martin, J. (1991). Two cases of naloxone-induced pulmonary oedema: The possible use of phentolamine in management. *Anesthesia Intensive Care*, *19*(4), 578–580.

Brogly, N., Wattier, J. M., Andrieu, G., Peres, D., Robin, E., Kipnis, E., ... Lebuffe, G. (2008). Gabapentin attenuates late but not early postoperative pain after thyroidectomy with superficial cervical plexus block. *Anesthesia & Analgesia*, *107*(5), 1720–1725.

Buvanendran, A., Kroin, J. S., Della Valle, C. J., Kari, M., Moric, M., & Tuman, K. J. (2010). Perioperative oral pregabalin reduces chronic pain after total knee arthroplasty: A prospective, randomized, controlled trial. *Anesthesia & Analgesia*, *110*(1), 199–207.

Carli, F., Mayo, N., Klubien, K., Schricker, T., Trudel, J., & Belliveau, P. (2002). Epidural analgesia enhances functional exercise capacity and health-related

quality of life after colonic surgery. *Anesthesiology*, *97*(3), 540–549.

Carroll, I. R., Angst, M. S., & Clark, J. F. (2004). Management of perioperative pain in patients chronically consuming opioids. *Regional Anesthesia Pain Medicine*, *29*(6), 576–591.

Carvalho, B., Riley, E., Cohen, S. E., Gambling, D., Palmer, C., Huffnagle, H. J., ... DepoSur Study Group. (2005). Single-dose, sustained-release epidural morphine in the management of postoperative pain after elective cesarean delivery: Results of a multicenter randomized controlled study. *Anesthesia & Analgesia*, *100*(4), 1150–1158.

Charuluxananan, S., Somboonviboon, W., Kyokong, O., & Nimcharoendee, K. (2000). Ondansetron for treatment of intrathecal morphine-induced pruritus after cesarean delivery. *Regional Anesthesia Pain Medicine*, *25*(5), 535–539.

Compton, P. (1999). Substance abuse. In M. McCaffery & C. Pasero (Eds.), *Pain: Clinical manual* (2nd ed., pp. 429–466). St. Louis, MO: Mosby.

Deery, C.J., Derry, S., & Moore, R.A. (2013). Single dose oral ibuprofen plus paracetamol (acetaminophen) for acute postoperative pain. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No.: CD010210. DOI: 10.1002/14651858.CD010210.pub2.

Doi, K., Shimoda, R., & Gibbons, G. (2014). Improving pain management in orthopedic surgical patients with opioid tolerance. *Nursing Clinics of North America, 49*, 415–429.

Dykstra, K.M. (2012). Perioperative pain management in the opioid-tolerant patient with chronic pain: An evidence-based practice project. *Journal of PeriAnesthesia Nursing, 27*(6), 385–392.

Fishbain, D. A., Cole, B., Lewis, J., Rosomoff, H. L, & Rosomoff, R. S. (2008). What percentage of chronic nonmalignant pain patients exposed to chronic opioid analgesic therapy develop abuse/addiction and/or aberrant drug-related behaviors? A structured evidence-based review. *Pain Medicine*, *9*(4), 444–459.

Forrest, J. B., Camu, F., Greer, I. A., Kehlet, H., Abdalla, M., Bonnet, F., ... POINT Investigators. (2002). Ketorolac, diclofenac, and ketoprofen are equally safe for pain relief after major surgery. *British Journal of Anaesthesia*, *88*(2), 227–233.

Gagliese, L., Gauthier, L. R., Macpherson, A. K., Jovellanos, M., & Chan, V. W. (2008). Correlates of postoperative pain and intravenous patient-controlled analgesia use in younger and older surgical patients. *Pain Medicine*, *9*(3), 299–314.

Gan, T. J., Meyer, T., Apfel, C. C., Chung, F., Davis, P. J., Eubanks, S., ... Watcha, M. (2014). Consensus guidelines for managing postoperative nausea and vomiting. *Anesthesia & Analgesia*, *118*(1), 85–113.

Gan, T. J, Meyer, T., Apfel, C. C., Chung, F., Davis, P. J., Habib, A. S., ... Department of Anesthesiology, Duke University Medical Center. (2007). Society for Ambulatory Anesthesia guidelines for the management of postoperative nausea and vomiting. *Anesthesia & Analgesia*, *105*(6), 1615–1628.

Gelinas, C., & Arbour, C. (2009). Behavioral and physiologic indicators during a nociceptive procedure in conscious and unconscious mechanically-ventilated adults: Similar or different? *Journal of Critical Care*, *24*(4), e7–17.

Gelinas, C., Fillion, L., Puntillo, K. A., Viens, C., & Fortier, M. (2006). Validation of critical-care pain observation tool. *American Journal of Critical Care*, *15*(4), 420–427.

Gelinas, C., Harel, F., Fillion, L., Puntillo, K. A., & Johnston, C. (2009). Sensitivity and specificity of the critical-care pain observation tool for the detection of pain in intubated adults after cardiac surgery. *Journal of Pain Symptom Management*, *37*(1), 58–67.

Gelinas, C., & Johnston, C. (2007). Pain assessment in the critically ill ventilated adult: Validation of the CPOT. *Clinical Journal of Pain*, *23*(6), 497–505.

Gilron, I. (2006). Review article: The role of anticonvulsant drugs in postoperative pain management: A bench-to-bedside perspective. *Canadian Journal of Anesthesia*, *53*(6), 562–571.

Grape, S., & Schug, S. A. (2008). Epidural and spinal analgesia. In P. E. Macintyre, S. M. Walker, & D. J. Rowbotham (Eds.), *Clinical pain management. Acute pain* (pp. 255–270). London: Hodder Arnold.

Gritsenko, K., Khelemsky, Y., Kaye, A.D., Vadivelu, N., & Urman, R.D. (2014). Multimodal therapy in perioperative analgesia. *Best Practice & Research Clinical Anaesthesiology, 28*, 59–79.

Gurkan, Y., & Toker, K. (2002). Prophylactic ondansetron reduces the incidence of intrathecal fentanyl-induced pruritus. *Anesthesia & Analgesia*, *96*(6), 1763–1766.

Hadjistavropoulos, T., Herr, K., Turk, D., Fine, P. G., Dworkin, R. H., Helme, R., ... Williams, J. (2007). An interdisciplinary expert consensus statement on assessment of pain in older persons. *Clinical Journal of Pain*, *23*(1), S1–S43.

Hanks, G., Roberts, C. J. C., & Davies, A. N. (2004). Principles of drug use in palliative medicine. In D. Doyle, G. Hanks, N. I. Cherny, & K. Calman (Eds.), *Oxford textbook of palliative medicine* (3rd ed., pp. 213–225). New York: Oxford Press.

Harris, J. D., & Kotob, F. (2006). In O. A. de Leon-Casasola (Ed.), *Cancer pain. Pharmacological, interventional and palliative care approaches* (pp. 207–234). Philadelphia: Saunders Elsevier.

Heitz, J. W., & Viscusi E. R. (2009). Novel analgesic drug delivery systems for acute pain management. In R. S. Sinatra, O. A. de Leon-Casasola, B. Ginsberg, & E. R. Viscusi (Eds.), *Acute pain management* (pp. 323–331). New York: Cambridge University Press.

Helstrom, J., & Rosow, C. E. (2006). Nonsteroidal anti-inflammatory drugs in postoperative pain. In G. Shorten, D. B. Carr, D. Harmon, M. M. Puig, & J. Browne (Eds.), *Postoperative pain management: An evidence-based guide to practice* (pp. 161–181). Philadelphia: Saunders Elsevier.

Henry, A., Tetzlaff, J. E., & Steckner, K. (2002). Ondansetron is effective in treatment of pruritus after intrathecal fentanyl. *Regional Anesthesia & Pain Medicine*, *27*(5), 538–539.

Herr, K., Coyne, P. J., McCaffery, M., Manworren, R., & Merkel, S. (2011). Pain assessment in the patient unable to self-report: Position statement with clinical practice recommendations. *Pain Management Nursing*, *12*(4), 230–250.

Ho, K. T., & Gan, T. J. (2009). Opioid-related adverse effects and treatment options. In R. S. Sinatra, O. A. de Leon-Casasola, B. Ginsberg, & E. R. Viscusi (Eds.), *Acute pain management* (pp. 406–415). New York: Cambridge University Press.

Ho, K. Y., Gan, T. J., & Habib, A. S. (2006). Gabapentin and postoperative pain—a systematic review of randomized controlled trials. *Pain*, *126*(1–3), 91–101.

Hurley, R. W., Cohen, S. P., Williams, K. A., Rowlingson, A. J., & Wu, C. L. (2006). The analgesic effects of perioperative gabapentin on postoperative pain: A meta-analysis. *Regional Anesthesia & Pain Medicine*, *31*(3), 237–247.

Iatrou, C. A., Dragoumanis, C. K., Vogiatzaki, T. D., Vretzakis, G. I., Simopoulos, C. E., & Dimitriou, V. K. (2005). Prophylactic intravenous ondansetron and dolasetron in intrathecal morphine-induced pruritus: A randomized, double-blinded, placebo-controlled study. *Anesthesia & Analgesia*, *101*(5), 1516–1520.

International Association for the Study of Pain. (2011) Part III: Pain terms, a current list with definitions and notes on usage. In *Classifications of chronic pain* (2nd ed., revised). Seattle, WA: IASP Press. Retrieved from http://www.iasp-pain.org/files/Content/ContentFolders/Publications2/ClassificationofChronicPain/Part_III-PainTerms.pdf

Jackson, K. C. (2009). Opioid pharmacology. In H. S. Smith (Ed.), *Current therapy in pain* (pp. 78–84). Philadelphia: Saunders Elsevier.

Jarzyna, D., Jungquist, C.R., Pasero, C., Willens, J.S., Nisbet, A., Oakes, L., Dempsey, S.J., ... Poloman, R.C. (2011). American Society for Pain Management Nursing guidelines on monitoring for opioid-induced sedation and respiratory depression. *Pain Management Nursing, 12*(3), 118–145.

Joshi, G.P., Schug, S.A., Kehlet, H. (2014). Procedure-specific pain management and outcome strategies. *Best Practice & Research Clinical Anaesthesiology, 28*, 191–201.

Katz, N., & Mazer, N. A. (2009). The impact of opioids on the endocrine system. *Clinical Journal of Pain*, *25*(2), 170–175.

Keïta, H., Tubach, F., Maalouli, J., Desmonts, J. M., & Mantz, J. (2008). Age-adapted morphine titration produces equivalent analgesia and adverse effects in younger and older patients. *European Journal of Anaesthesiology*, *25*(5), 352–356.

Kobelt, P. (2014). Implementation of a standardized approach to assessment of opioid-induced sedation in the postanesthesia care unit. *Journal of PeriAnesthesia Nursing, 29*(5), 434–440.

Kobelt, P., Burke, K., & Renker, P. (2013). Evaluation of a standardized sedation assessment for opioid administration in the post anesthesia care unit. *Pain Management Nursing, 15*(3), 672–681.

Laine, L., White, W. B., Rostom, A., & Hochberg, M. (2008). COX-2 selective inhibitors in the treatment of osteoarthritis. *Seminars in Arthritis & Rheumatism*, *38*(3), 165–187.

Launay-Vacher, V., Karie, S., Fau, J. B., Izzedine, H., & Deray, G. (2005). Treatment of pain in patients with renal insufficiency: The World Health Organization three-step ladder adapted. *The Journal of Pain*, *6*(3), 137–148.

Lee, A., Cooper, M. G., Craig, J. C., Knight, J. F., & Keneally, J. P. (2007). Effects of nonsteroidal anti-inflammatory drugs on postoperative renal function in adults with normal renal function. *Cochrane Database of Systematic Reviews*, *2*, CD002765. doi: 10.1002/14651858.CD002765.pub3

Lucas, C. E., Vlahos, A. L., & Ledgerwood, A. M. (2007). Kindness kills: The negative impact of pain as the fifth vital sign. *Journal of American College of Surgeons*, *205*(1), 101–107.

Lvovschi, V., Aubrun, F., Bonnet, P., Bouchara, A., Bendahou, M., Humbert, B., ... Riou, B. (2008). Intravenous morphine titration to treat severe pain in the ED. *American Journal of Emergency Medicine*, *26*(6), 676–682.

Maund, E., McDaid, C., Rice, S. M., Wright, K., Jenkins, B., & Woolacott, N. (2011). Paracetamol and selective and non-selective non-steroidal anti-inflammatory drugs for the reduction in morphine-related side-effects after major surgery: A systematic review. *British Journal of Anaesthesia, 106*(3), 292–297.

May, J. A., White, H. C., Leonard-White, A., Warltier, D. C., & Pagel, P. S. (2001). The patient recovering from alcohol or drug addiction: Special issues for the anesthesiologist. *Anesthesia & Analgesia*, *92*(6), 1601–1608.

McCaffery, M. (1968). *Nursing practice theories related to cognition, bodily pain, and man-environment interactions*. Los Angeles: University of California.

McCaffery, M., Herr, K., & Pasero, C. (2011). Assessment: Basic problems, misconceptions, and practical tools. In C. Pasero & M. McCaffery, *Pain assessment and pharmacologic management* (pp. 13–177). St. Louis: Mosby.

McCaffery, M., & Pasero, C. (1999). Assessment: Underlying complexities, misconceptions, and practical tools. In M. McCaffery & C. Pasero (Eds.), *Pain: Clinical manual* (2nd ed., pp. 35–102). St. Louis, MO: Mosby.

Mehta, V., & Langford, R. M. (2006). Acute pain management for opioid dependent patients. *Anaesthesia*, *61*(3), 269–276.

Mitra, S., & Sinatra, R. S. (2004). Perioperative management of acute pain in the opioid dependent patient. *Anesthesiology*, *101*(1), 212–227.

Miyoshi, H. R. (2001). Systemic nonopioid analgesics. In J. D. Loeser, S. H. Butler, & C. R. Chapman (Eds.),

Bonica's management of pain (3rd ed., pp. 1667–1681). Philadelphia: Lippincott Williams & Wilkins.

Murcia Sanchez, E., Orts Castro, A., Perez Doblado, P., & Perez-Cerda, F. (2006). Pre-emptive analgesia with pregabalin in laparascopic cholecystectomy. *European Journal of Pain*, *10*(1), S198.

Myles, P. S. (2004). The pain visual analog scale: Linear or nonlinear? *Anesthesiology*, *100*(3), 744.

Ng, A., Swami, A., Smith, G., & Emembolu, J. (2008). Early analgesic effects of intravenous parecoxib and rectal diclofenac following laparoscopic sterilization: A double-blind, double-dummy randomized controlled trial. *Journal of Opioid Management*, *4*(1), 49–53.

Nisbet, A. T., & Mooney-Cotter, F. (2009). Selected scales for reporting opioid-induced sedation. *Pain Management Nursing*, *10*(3), 154–164.

Nussmeier, N. A., Whelton, A. A., Brown, M. T., Langford, R. M., Hoeft, A., Parlow, J. L., ... Verburg, K. M. (2005). Complications of the COX-2 inhibitors parecoxib and valdecoxib after cardiac surgery. *New England Journal of Medicine*, *352*(11), 1081–1091.

O'Malley-Dafner, L., & Davies, P. (2000). Naloxone-induced pulmonary edema. *American Journal of Nursing*, *100*(11), 24AA–24JJ.

Ott, E., Nussmeier, N. A., Duke, P. C., Feneck, R. O., Alston, R. P., Snabes, M. C., ... Ischemia Research and Education Foundation (IREF) Investigators. (2003). Efficacy and safety of the cyclooxygenase 2 inhibitors parecoxib and valdecoxib in patients undergoing coronary artery bypass surgery. *The Journal of Thoracic & Cardiovascular Surgery*, *125*(6), 1481–1492.

Page, G. (2005). Immunologic effects of opioids in the presence or absence of pain. *Journal of Pain & Symptom Management*, *29*(5), S25–S31.

Paqueron, X., Lumbroso, A., Mergoni, P., Aubrun, F., Langeron, O., Coriat, P., & Riou, B. (2002). Is morphine-induced sedation synonymous with analgesia during intravenous morphine titration? *British Journal of Anaesthesia*, *89*(5), 687–701.

Pasero, C. (2009a). Challenges in pain assessment. *Journal of PeriAnesthesia Nursing*, *24*(1), 50–54.

Pasero, C. (2009b). Assessment of sedation during opioid administration for pain management. *Journal of PeriAnesthesia Nursing*, *24*(3), 186–190.

Pasero, C. (2010a). Safe IV opioid titration in patients with severe acute pain. *Journal of PeriAnesthesia Nursing, 25*(5), 314–318.

Pasero, C. (2010b). Perioperative rectal administration of nonopioid analgesics. *Journal of PeriAnesthesia Nursing*, *25*(1), 5–6.

Pasero, C. (2011). Persistent postsurgical and posttrauma pain. *Journal of PeriAnesthesia Nursing, 26*(1), 38–42.

Pasero, C. (2013). The perianesthesia nurse's role in the prevention of opioid-related sentinel events. *Journal of PeriAnesthesia Nursing, 28*(1), 31–37.

Pasero, C. (2014). One size does not fit all: Opioid range orders. *Journal of PeriAnesthesia Nursing, 29*(3), 246–252.

Pasero, C., Eksterowicz, N., Primeau, M., & Cowley, C. (2007). ASPMN position statement: Registered nurse management and monitoring of analgesia by catheter techniques. *Pain Management Nursing*, *8*(2), 48–54.

Pasero, C., & McCaffery, M. (2002). Pain in the critically ill. *American Journal of Nursing*, *102*(1), 59–60.

Pasero, C., & McCaffery, M. (2005a). No self-report means no pain intensity. *American Journal of Nursing*, *105*(10), 50–53.

Pasero, C., & McCaffery, M. (2005b). Extended-release epidural morphine: DepoDur. *Journal of Perianesthesia Nursing*, *20*(5), 345–350.

Pasero, C., Polomano, R.C., Portenoy, R.K., McCaffery, M. (2011). Adjuvant analgesics. In Pasero C, McCaffery M, *Pain Assessment and Pharmacologic Management*, pp. 623–818. St. Louis, Mosby Elsevier.

Pasero, C., & Portenoy, R. K. (2011). Neurophysiology of pain and analgesia and the pathophysiology of neuropathic pain. In C. Pasero & M. McCaffery (Eds.), *Pain assessment and pharmacologic management* (pp. 1–12). St. Louis, MO: Mosby.

Pasero, C., Portenoy, R. K., & McCaffery, M. (2011). Nonopioid analgesics. In C. Pasero & M. McCaffery (Eds.), *Pain assessment and pharmacologic management* (pp. 177–276). St. Louis, MO: Mosby.

Pasero, C., Quinlan-Colwell, A., Rae, D., Broglio, K., & Drew, D. (2016). Prescribing and administering opioid doses based solely on pain intensity: American Society for Pain Management Nursing position statement. Retrieved from http://aspmn.org/Documents/Position%20Statements/Dose_Numbers_PP_Final.pdf

Pasero, C., Quinn, T. E., Portenoy, R. K., McCaffery, M., & Rizos, A. (2011). Opioid analgesics. In C. Pasero & M. McCaffery (Eds.), *Pain assessment and pharmacologic management* (pp. 277–622). St. Louis, MO: Mosby.

Patanwala, A. E., Jarzyna, D. L., Miller, M. D., & Erstad, B. (2008). Comparison of opioid requirements and analgesic response in opioid-tolerant versus opioid-naïve patients after total knee arthroplasty. *Pharmacotherapy*, *28*(12), 1453–1460.

Peng, P. W. H., Wijeysundera, D. N., & Li, C. C. F. (2007). Use of gabapentin for perioperative pain control—a meta-analysis. *Pain Research & Management*, *12*(2), 85–91.

Pirat, A., Tuncay, S. F., Torga, A., Candan, S., & Arslan, G. (2005). Ondansetron, orally disintegrating tablets versus intravenous injection for prevention of intrathecal morphine-induced nausea, vomiting and pruritus in young males. *Anesthesia & Analgesia*, *101*(5), 1330–1336.

Portenoy, R. K., Farrar, J. T., Backonja, M. M., Cleeland, C. S., Yang, K., Friedman, M., ... Richards, P. (2007). Long-term use of controlled-release oxycodone for noncancer pain: Results of a 3-year registry study. *The Clinical Journal of Pain*, *23*(4), 287–299.

Puntillo, K. A., White, C., Morris, A. B., Perdue, S. T., Stanik-Hutt, J. A., Thompson, C. L., & Wild, L. R. (2001). Patients' perceptions and responses to procedural pain: Results from Thunder Project II. *American Journal of Critical Care*, *10*(4), 238–251.

Redelmeier, D. (2007). New thinking about postoperative delirium. *Canadian Medical Association Journal*, *177*(4), 424.

Romsing, J., Møiniche, S., & Dahl, J. B. (2002). Rectal and parenteral paracetamol, and paracetamol in combination with NSAIDs, for postoperative analgesia. *British Journal of Anaesthesia*, *88*(2), 215–226.

Santoso, J.T., Ulm, M.A., Jennings, P.W., & Wan, J.Y. (2014). Multimodal pain control is associated with reduced hospital stay following open abdominal hysterectomy. *European Journal of Obstetrics & Gynecology Reproductive Biology, 183*, 48–51.

Seib, R. K., & Paul, J. E. (2006). Preoperative gabapentin for postoperative analgesia: A meta-analysis. *Canadian Journal of Anaesthesia*, *53*(5), 461–469.

Sharma, P. T., Sieber, F. E., Zakriya, K. J., Pauldine, R. W., Gerold, K. B., Hang, J., & Smith, T. H. (2005). Recovery room delirium predicts postoperative delirium after hip-fracture repair. *Anesthesia & Analgesia*, *101*(4), 1215–1220.

Stanik-Hutt, J. A., Soeken, K. L., Belcher, A. E., Fontaine, D. K., & Gift, A. G. (2001). Pain experiences of the traumatically injured in a critical care setting. *American Journal of Critical Care*, *10*(4), 252–259.

The Joint Commission. (2012). Safe use of opioids in hospitals. *The Joint Commission Sentinel Event Alert, 49*. Retrieved from http://www.jointcommission.org/sea_issue_49/.

Tiippana, E. M., Hamunen, K., Kontinen, V. K., & Kalso, E. (2007). Do surgical patients benefit from perioperative gabapentin/pregabalin? A systematic review of efficacy and safety. *Anesthesia & Analgesia*, *104*(6), 1545–1556.

United States Food and Drug Administration. (2007). *Medication guide for non-steroidal anti-inflammatory drugs (NSAIDs).* Retrieved from http://www.fda.gov/downloads/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/UCM106241.pdf

Vadivelu, N., Whitney, C. J., & Sinatra, R. S. (2009). Pain pathways and acute pain processing. In R. S. Sinatra, O. A. de Leon-Casasola, B. Ginsberg, & E. R. Viscusi (Eds.), *Acute pain management* (pp. 3–20). New York: Cambridge University Press.

Vaurio, L. E., Sands, L. P., Wang, Y., Mullen, E. A., & Leung, J. M. (2006). Postoperative delirium: The importance of pain and pain management. *Anesthesia & Analgesia*, *102*(4), 1267–1273.

Vila, H., Smith, R. A., Augustyniak, M. J., Nagl, P. A., Soto, R. G., Ross, T. W.,... Miguel, R. V. (2005). The efficacy and safety of pain management before and after implementation of hospital-wide pain management standards: Is patient safety compromised by treatment based solely on numerical pain ratings? *Anesthesia & Analgesia*, *101*(2), 474–480.

Viscusi, E. R., Martin, G., Hartrick, C. T., Singla, N., Manvelian, G., & EREM Study Group. (2005). Forty-eight hours of postoperative pain relief after total hip arthroplasty with a novel, extended-release epidural morphine formulation. *Anesthesiology*, *102*(5), 1014–1022.

Visser, E. J., & Goucke, C. R. (2008). Acute pain and medical disorders. In P. E. Macintyre, S. M. Walker, & D. J. Rowbotham (Eds.), *Clinical pain management: Acute pain* (2nd ed., pp. 410–429). London: Hodder Arnold.

Webster, L. R., & Dove, B. (2007). *Avoiding opioid abuse while managing pain*. North Branch, MN: Sunrise River Press.

Weissman, D. E., & Haddox, J. D. (1989). Opioid pseudoaddiction—an iatrogenic syndrome. *Pain*, *36*(3), 363–366.

Wellington, J., & Chia Y. Y. (2009). Patient variables influencing acute pain management. In R. S. Sinatra, O. A. de Leon-Casasola, B. Ginsberg, & E. R. Viscusi (Eds.), *Acute pain management* (pp. 33–40). New York: Cambridge University Press.

Zakriya, K. J., Christmas, C., Wenz, J. F., Franckowiak, S., Anderson, R., & Sieber, F. E. (2002). Preoperative factors associated with postoperative change in confusion assessment method score in hip fracture patients. *Anesthesia & Analgesia*, *94*(6), 1628–1632.