CHAPTER 11

Analgesic Drugs

OBJECTIVES
When you reach the end of this chapter, you should be able to do the following:

1. Define acute pain and chronic pain.
2. Contrast the signs, symptoms, and management of acute and chronic pain.
3. Describe pharmacologic and nonpharmacologic approaches for the management of acute and chronic pain.
4. Discuss the use of nonopioids, nonsteroidal antiinflammatory drugs, and opioids (opioid agonists, opioids with mixed actions, or opioid agonists-antagonists and antagonists) and miscellaneous drugs in the management of pain, including acute and chronic pain, cancer pain, and special pain situations.
5. Identify examples of drugs classified as nonopioids, nonsteroidal antiinflammatory drugs, opioid agonists, opioids with mixed actions, opioid antagonists, as well as any miscellaneous drugs.
6. Briefly describe the mechanism of action, indications, dosages, routes of administration, adverse effects, toxicity, contraindications, and drug interactions of nonopioids (see Chapter 44), opioid agonists, opioids with mixed actions, antagonists, and miscellaneous drugs.
7. Contrast the pharmacologic and nonpharmacologic management of acute and chronic pain with the management of pain associated with cancer and pain experienced in terminal conditions.
8. Briefly describe special pain situations as well as specific standards of pain management as defined by the World Health Organization and the Joint Commission.
9. Develop a nursing care plan based on the nursing process related to the use of nonopioid and opioid drug therapy for patients in pain.
10. Identify various resources, agencies, and professional groups that are involved in establishing standards for the management of all types of pain and for promotion of a holistic approach to the care of patients with acute or chronic pain and those in special pain situations.

Drug Profiles

- acetaminophen, p. 166
- codeine sulfate, p. 163
- fentanyl, p. 163
- lidocaine, p. 167
- meperidine hydrochloride, p. 164
- methadone hydrochloride, p. 164
- morphine sulfate, p. 161
- naloxone hydrochloride, p. 165
- naltrexone hydrochloride, p. 165
- oxycodeone hydrochloride, p. 165
- tramadol hydrochloride, p. 164
- ziconotide, p. 167

- Key drug.

Glossary

Acute pain Pain that is sudden in onset, usually subsides when treated, and typically occurs over less than a 6-week period. (p. 153)

Addiction A primary, chronic, neurobiologic disease whose development is influenced by genetic, psychosocial, and environmental factors (same as psychologic dependence). (p. 156)

Adjuvant analgesic drugs Drugs that are added as a second drug for combined therapy with a primary drug and may have additive or independent analgesic properties, or both. (p. 152)

Agonist A substance that binds to a receptor and causes a response. (p. 158)

Agonists-antagonists Substances that bind to a receptor and cause a partial response that is not as strong as that caused by an agonist (also known as a partial agonist). (p. 158)

Analgesic ceiling effect What occurs when a given pain drug no longer effectively controls a patient’s pain despite the administration of the highest safe dosages. (p. 158)

Analgesics Medications that relieve pain without causing loss of consciousness (sometimes referred to as painkillers). (p. 152)

Antagonist A drug that binds to a receptor and prevents (blocks) a response. (p. 158)

Breakthrough pain Pain that occurs between doses of pain medication. (p. 157)

Cancer pain Pain resulting from any of a variety of causes related to cancer and/or the metastasis of cancer. (p. 154)

Central pain Pain resulting from any disorder that causes central nervous system damage. (p. 154)

Chronic pain Persistent or recurring pain that is often difficult to treat. Includes any pain lasting longer than 3 to 6 months, pain lasting longer than 1 month after healing of an acute tissue injury, or pain that accompanies a nonhealing tissue injury. (p. 153)

Deep pain Pain that occurs in tissues below skin level; opposite of superficial pain. (p. 154)
**Gate theory** The most common and well-described theory of pain transmission and pain relief. It uses a gate model to explain how impulses from damaged tissues are sensed in the brain. (p. 154)

**Narcotics** A legal term established under the Harrison Narcotic Act of 1914. It originally applied to drugs that produce insensibility or stupor, especially the opioids (e.g., morphine, heroin). Currently used in clinical settings to refer to any medically used controlled substances and legal settings to refer to any illicit or “street” drug. (Note: This term is falling out of use in favor of opioid and will not be used in this text.)

**Neuropathic pain** Pain that results from a disturbance of function or pathologic change in a nerve. (p. 154)

**Nociception** Processing of pain signals in the brain that gives rise to the feeling of pain. (p. 153)

**Nociceptors** A subclass of sensory nerves (A and C fibers) that transmit pain signals to the central nervous system from other body parts. (p. 153)

**Nonopioid analgesics** Analgesics that are not classified as opioids. (p. 153)

**Nonsteroidal antiinflammatory drugs (NSAIDs)** A large, chemically diverse group of drugs that are analgesics and also possess antiinflammatory and antipyretic activity but are not steroids. (p. 154)

**Opioid analgesics** Synthetic drugs that bind to opiate receptors to relieve pain but are not themselves derived from the opium plant. (p. 152)

**Opioid naive** Describes patients who are receiving opioid analgesics for the first time and who therefore are not accustomed to their effects. (p. 161)

**Opioid tolerance** A normal physiologic condition that results from long-term opioid use, in which larger doses of opioids are required to maintain the same level of analgesia and in which abrupt discontinuation of the drug results in withdrawal symptoms (same as physical dependence). (p. 156)

**Opioid tolerant** The opposite of opioid naive; describes patients who have been receiving opioid analgesics (legally or otherwise) for a period of time (1 week or longer) and who are therefore at greater risk of opioid withdrawal syndrome upon sudden discontinuation of opioid use. (p. 157)

**Opioid withdrawal** The signs and symptoms associated with abstinence from or withdrawal of an opioid analgesic when the body has become physically dependent on the substance. (p. 161)

**Pain** An unpleasant sensory and emotional experience associated with actual or potential tissue damage. (p. 152)

**Pain threshold** The level of a stimulus that results in the sensation of pain. (p. 153)

**Pain tolerance** The amount of pain a patient can endure without its interfering with normal function. (p. 153)

**Partial agonist** A drug that binds to a receptor and causes an activation response that is less than that caused by a full agonist (same as antagonist-agonist). (p. 158)

**Phantom pain** Pain experienced in the area of a body part that has been surgically or traumatically removed. (p. 154)

**Physical dependence** A state of adaptation that is manifested by a drug class-specific withdrawal syndrome that can be produced by abrupt cessation, rapid dose reduction, decreasing blood level of the drug, and/or administration of an antagonist. The physical adaptation of the body to the presence of an opioid or other addictive substance. (p. 153)

**Psychologic dependence** A pattern of compulsive use of opioids or any other addictive substance characterized by a continuous craving for the substance and the need to use it for effects other than pain relief (also called addiction). (p. 156)

**Referred pain** Pain occurring in an area away from the organ of origin. (p. 154)

**Somatic pain** Pain that originates from skeletal muscles, ligaments, or joints. (p. 154)

**Special pain situations** The general term for pain control situations that are complex and whose treatment typically involves multiple medications, various health care personnel, and nonpharmacologic therapeutic modalities (e.g., massage, chiropractic care, surgery). (p. 175)

**Superficial pain** Pain that originates from the skin or mucous membranes; opposite of deep pain. (p. 154)

**Synergistic effects** Drug interactions in which the effect of a combination of two or more drugs with similar actions is greater than the sum of the individual effects of the same drugs given alone. For example, 1 + 1 is greater than 2. (p. 157)

**Tolerance** The general term for a state of adaptation in which repetitive exposure to a given drug, over time, induces changes in drug receptors that reduce one or more of the drug’s effects (same as physical dependence). (p. 153)

**Vascular pain** Pain that results from a pathology of the vascular or perivascular tissues. (p. 154)

**Visceral pain** Pain that originates from organs or smooth muscles. (p. 154)

**World Health Organization** An international body of health care professionals, including clinicians and epidemiologists among many others, that studies and responds to health needs and trends worldwide. (p. 158)

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**Anatomy, Physiology, and Disease Overview**

The management of pain is a very important aspect of nursing care in a variety of settings and across the life span. Pain is the most common reason that patients seek health care, resulting in some 70 million office visits annually in the United States. Surgical and diagnostic procedures often require pain management, as do several diseases including arthritis, diabetes, multiple sclerosis, cancer, and acquired immunodeficiency syndrome (AIDS).

To provide quality patient care, nurses must be well informed about both pharmacologic and nonpharmacologic methods of pain management. This chapter focuses on pharmacologic methods of pain management. Nonpharmacologic methods of pain management are listed in Box 11-1.

Medications that relieve pain without causing loss of consciousness are classified as analgesics. They are also commonly referred to as analgesics. There are various classes of analgesics, determined by their chemical structures and mechanisms of action. This chapter focuses primarily on the opioid analgesics, which are normally used to manage moderate to severe pain. Often drugs from other chemical categories are added to the opioid regimen as adjuvant analgesics (or adjuvants) and are described later.

**Pain** is most commonly defined as an unpleasant sensory and emotional experience associated with either actual or potential tissue damage. It is a very personal and individual experience. Pain can be defined as whatever the patient says it is, and it exists whenever the patient says it does. Although the mechanisms of pain and the nature of pain pathways are becoming better understood, a patient’s perception of pain is a complex process. Pain involves physical, psychologic, and even...
pain depends on his or her psychologic experiences of pain. Pain results from the simultaneous activation of nociceptors, which are specialized nerve endings that detect tissue damage. These nociceptors transmit pain signals from various body regions to the spinal cord and brain, which leads to the sensation of pain, or nociception (Figure 11-1).

The physical impulses that signal pain activate various nerve pathways from the periphery to the spinal cord and to the brain. The level of stimulus needed to produce a painful sensation is referred to as the pain threshold. Because this is technically a measure of the physiologic response of the nervous system, it is similar for most persons. However, variations in pain sensitivity may result from genetic factors.

There are three main receptors believed to be involved in pain. The mu receptors in the dorsal horn of the spinal cord appear to be closely linked to the number of mu receptors. This number is controlled by a single gene, the mu opioid receptor gene. When the number of receptors is high, pain sensitivity is diminished. Conversely, when the receptors are reduced or missing altogether, relatively minor noxious stimuli may be perceived as painful.

The patient’s emotional response to the pain is also molded by cultural factors (see Cultural Implications box). Because pain intensity cannot be precisely quantified, health care providers must cultivate relationships of mutual trust with their patients to provide optimal care.

There is no single approach to effective pain management. Instead, pain management should be tailored to each patient’s needs and should consider the cause of the pain, the existence of concurrent medical conditions; the characteristics of the pain; and the psychologic and cultural characteristics of the patient. It also requires ongoing reassessment of the pain and the effectiveness of treatment. The patient’s emotional response to pain depends on his or her psychologic experiences of pain. Pain results from the stimulation of sensory nerve fibers known as nociceptors. These receptors transmit pain signals from various body regions to the spinal cord and brain, which leads to the sensation of pain, or nociception (Figure 11-1).

The level of stimulus needed to produce a painful sensation is referred to as the pain threshold. Because this is technically a measure of the physiologic response of the nervous system, it is similar for most persons. However, variations in pain sensitivity may result from genetic factors.

There are three main receptors believed to be involved in pain. The mu receptors in the dorsal horn of the spinal cord appear to play a crucial role. Less important but still involved in pain sensations are the kappa and delta receptors. Pain receptors are located in both the central nervous system (CNS) and various body tissues. Pain perception—and, conversely, emotional well-being—is closely linked to the number of mu receptors. This number is controlled by a single gene, the mu opioid receptor gene. When the number of receptors is high, pain sensitivity is diminished. Conversely, when the receptors are reduced or missing altogether, relatively minor noxious stimuli may be perceived as painful.

The patient’s emotional response to the pain is also molded by the patient’s age, sex, culture, previous pain experience, and anxiety level. Whereas pain threshold is the physiologic element of pain, as described earlier, the psychologic element of pain is called pain tolerance. This is the amount of pain a patient can endure without its interfering with normal function. Because it is a subjective response, pain tolerance can vary from patient to patient and can be modulated by the patient’s personality, attitude, environment, culture, and ethnic background. Pain tolerance can even vary within the same person depending on the circumstances involved. Table 11-1 lists the various conditions that can alter one’s pain tolerance.

Pain can also be further classified in terms of its onset and duration as either acute or chronic. Acute pain is sudden and usually subsides when treated. One example of acute pain is postoperative pain. Chronic pain is persistent or recurring, lasting 3 to 6 months. It is often more difficult to treat, because changes occur in the nervous system that often require increasing drug dosages. This situation is known by the general term tolerance or physical dependence (see Chapter 9). Acute and chronic pain differ in their onset and duration, their associated diseases or conditions, and the way they are treated. Table 11-2 lists the different characteristics of acute and chronic pain and various diseases and conditions associated with each.
Pain can be further classified according to its source. The two most commonly mentioned sources of pain are somatic and visceral. **Somatic pain** originates from skeletal muscles, ligaments, and joints. **Visceral pain** originates from organs and smooth muscles. Sometimes pain is described as superficial. **Superficial pain** originates from the skin and mucous membranes, in contrast to deep pain, which occurs in tissues below skin level. Pain treatment may be more appropriately selected when the source of the pain is known. For example, visceral and superficial pain usually requires opioids for relief, whereas somatic pain (including bone pain) usually responds better to nonopioid analgesics such as nonsteroidal antiinflammatory drugs (NSAIDs) (see Chapter 44).

Pain can be further subclassified according to the diseases or other conditions that cause it. **Vascular pain** is believed to originate from pathology of the vascular or perivascular tissues and is thought to account for a large percentage of migraine headaches. **Referred pain** occurs when visceral nerve fibers or synapse at a level in the spinal cord close to fibers that supply specific subcutaneous tissues in the body. An example is the pain associated with cholecystitis, which is often referred to the back and scapular areas. **Neuropathic pain** usually results from damage to peripheral or CNS nerve fibers by disease or injury but may also be idiopathic (unexplained). **Phantom pain** occurs in the area of a body part that has been removed—surgically or traumatically—and is often described as burning, itching, tingling, or stabbing. It can also occur in paralyzed limbs following spinal cord injury. **Cancer pain** can be acute or chronic or both. It most often results from mechanical pressure of tumor mass against nerves, organs, or tissues. Other causes of cancer pain include hypoxia from blockage of blood supply to an organ, metastases, pathologic fractures, muscle spasms, and adverse effects of radiation, surgery, and chemotherapy. **Central pain** occurs with tumors, trauma, inflammation or disease (e.g., cancer, diabetes, stroke, multiple sclerosis) affecting CNS tissues.

Several theories attempt to explain pain transmission and pain relief. The most common and well described is the gate theory. This theory, proposed by Melzack and Wall in 1965, uses the analogy of a gate to describe how impulses from damaged tissues are sensed in the brain. First, the tissue injury causes the release of several substances from injured cells, such as bradykinin, histamine, potassium, prostaglandins, and serotonin. Some current pain medications work by altering the actions and levels of these substances (e.g., NSAIDs→prostaglandins; antidepressants→serotonin). The release of these pain-mediating chemicals initiates action potentials (electrical

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**TABLE 11-1 Conditions That Alter Pain Tolerance**

<table>
<thead>
<tr>
<th>Pain Threshold</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowered</td>
<td>Anger, anxiety, depression, discomfort, fear, isolation, chronic pain, sleeplessness, tiredness</td>
</tr>
<tr>
<td>Raised</td>
<td>Diversion, empathy, rest, sympathy, medications (analgesics, antianxiety drugs, antidepressants)</td>
</tr>
</tbody>
</table>

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**FIGURE 11-1** Illustration of the four processes of nociception. (From Jarvis C: Physical examination and health assessment, ed 5, Philadelphia, 2008, Saunders.)
nerve impulses) at the distal end of sensory nerve fibers through pain receptors known as *nociceptors*. These nerve impulses are conducted along sensory nerve fibers and activate pain receptors in the *dorsal horn* of the spinal cord. It is here that the so-called gates are located. These gates regulate the flow of sensory nerve impulses. If impulses are stopped by a gate at this junction, no impulses are transmitted to the higher centers of the brain. Conversely, if the gates permit a sufficient number and intensity of action potentials to be conducted from the spinal cord to the cerebral cortex, the sensation of pain is then felt. This is known as *nociception*. Figure 11-2 depicts the gate theory of pain transmission.

**TABLE 11-2 Acute Versus Chronic Pain**

<table>
<thead>
<tr>
<th>Type of Pain</th>
<th>Onset</th>
<th>Duration</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>Sudden (minutes to hours); usually sharp, localized; physiologic response (SNS: tachycardia, sweating, pallor, increased blood pressure)</td>
<td>Limited (has an end)</td>
<td>Myocardial infarction, appendicitis, dental procedures, kidney stones, surgical procedures</td>
</tr>
<tr>
<td>Chronic</td>
<td>Slow (days to months); long duration; dull, persistent aching</td>
<td>Persistent or recurring (endless)</td>
<td>Arthritis, cancer, lower back pain, peripheral neuropathy</td>
</tr>
</tbody>
</table>

SNS, Sympathetic nervous system.

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**FIGURE 11-2** Gate theory of pain transmission. CNS, Central nervous system.
Both the opening and the closing of this gate are influenced by the relative activation of the large-diameter A fibers and the small-diameter C fibers (Table 11-3). Closing of the gate seems to be affected by the activation of A fibers. This causes the inhibition of impulse transmission to the brain and avoidance of pain sensation. Opening of the gate is affected by the stimulation of the C fibers. This allows impulses to be transmitted to the brain and pain to be sensed. The gate is innervated by nerve fibers that originate in the brain and modulate the pain sensation by sending impulses to the gate in the spinal cord. These nerve fibers enable the brain to evaluate, identify, and localize the pain. Thus, the brain can control the gate, either keeping the gate closed or allowing it to open so that the brain is stimulated and pain is sensed. The cells that control the gate have a threshold. Impulses that reach these cells must rise above this threshold before an impulse is permitted to travel up to the brain.

The body is also equipped with certain endogenous neurotransmitters known as enkephalins and endorphins. These substances are produced within the body to fight pain and are considered the body’s painkillers. Both are capable of bonding with opioid receptors and inhibiting the transmission of pain impulses by closing the spinal cord gates, in a manner similar to that of opioid analgesic drugs. The term endorphin is a condensed version of the term “endogenous morphine.” These endogenous analgesic substances are released whenever the body experiences pain or prolonged exertion. For example, they are responsible for the phenomenon of “runner’s high.” Figure 11-1 depicts this entire process.

Another phenomenon of pain relief that may be explained by the gate theory is the fact that massaging a painful area often reduces the pain. When an area is rubbed or liniment is applied, large sensory A nerve fibers from peripheral receptors carry pain-modulating impulses to the spinal cord. Again, the A fibers tend to close the gate, which reduces pain sensation in the brain.

**TREATMENT OF PAIN IN SPECIAL SITUATIONS**

Estimates are that one of every three Americans experiences ongoing pain, and pain is poorly understood and often undertreated. In addition to enduring baseline chronic pain, patients with illnesses such as cancer, AIDS, and sickle cell anemia may also experience crisis periods of acute pain. Effective management of acute pain is often different from management of chronic pain in terms of medications and dosages used. Routes of drug administration may include oral, intravenous (IV), intramuscular (IM), subcutaneous (subcut), transdermal, and rectal. One intravenous route commonly used in the hospital setting is patient-controlled analgesia (PCA). In this situation, patients are able to self-medicate by pressing a switch on a PCA infusion pump. This has been shown to be very effective for many patients and even reduces the total opioid dose. Morphine and hydromorphone are commonly given by PCA. Potential hazards of PCA include well-meaning family members’ pressing the dosing button rather than letting able patients do so on their own. For patients truly not able to self-medicate using the PCA pump, a different method of pain control should be used. Numerous deaths have occurred when well-meaning family members have administered too much of the opioid drug. This is called **PCA by proxy**. The Institute for Safe Medication Practices (http://www.ismp.org) advises against PCA by proxy.

Patients with complex pain syndromes often benefit from a holistic or multimodal clinical approach that involves pharmacologic and/or nonpharmacologic treatment. Effective drug therapy in such situations may include use of opioid and/or nonopioid drugs. The goals of pain management include reducing and controlling pain, and improving body function and quality of life.

In situations such as pain associated with malignancies, the main consideration in pain management is patient comfort and not prevention of drug addiction (or psychologic dependence; see Chapter 9). **Opioid tolerance** is a state of adaptation in which exposure to a drug induces changes in drug receptors that result in reduced drug effects over time. This can occur in as little as 1 week. Because of increasing pathology (e.g., tumor burden), patients usually require increasingly higher opioid doses and thus do become physically dependent on these drugs. These patients are therefore more likely to experience withdrawal symptoms (see Chapter 9) if opioid doses are abruptly reduced or discontinued. Although actual psychologic dependence or addiction in such patients is unusual, it is now believed to be more likely in patients who have a genetic predisposition for addiction. For long-term pain control situations such as these, oral, intravenous, subcutaneous, transdermal, and sometimes even rectal dosing routes are favored over multiple intramuscular injections, due to associated puncture trauma (bruising) and erratic drug absorption.

One controversial issue in pain management is the use of placebos, inert dosage forms that actually lack medication. Some prescribers feel that this practice may be helpful by taking advantage of the well-documented placebo effect. The placebo effect is a psychologic therapeutic effect that occurs even in the absence of actual medication. It is believed to arise from activation of patients’ own endorphins. It is also attributed to the patient’s belief that any “treatment” is effective, as well as the patient’s high level of trust in the health care provider. Critics argue that the use of placebos is unethical, because it requires that the patient be deceived in the process. The use of placebos has fallen out of favor, and they are rarely used today (see Chapter 4 for further discussion).
The treatment of patients who are addicted to street opioids is of great concern to clinicians, who may be reluctant to prescribe opioid therapy for such patients. However, habitual street opioid users are also opioid tolerant and generally require high dosages. Longer-acting opioids such as methadone or extended-release oxycodone are usually better choices than shorter-acting immediate-release drug products for these patients. This is because the shorter-acting drugs are more likely to produce a psychologic “high” or euphoria, which only reinforces addictive tendencies. It should also be noted that genetic difference in cytochrome P-450 enzymes (see Chapters 2 and 5) can cause different patients, whether addicted or not, to respond more or less effectively to a given drug. For this reason, patients should not automatically be viewed with suspicion if they complain that a given drug does not work for them.

The label of “addict” can be used unfairly to justify refusal to prescribe pain medications, resulting in undertreatment of pain, even in patients who do not use street drugs. This is now generally regarded as inappropriate and inhumane clinical practice. In these situations, control of the patient’s pain takes ethical and clinical priority over concerns regarding drug addiction. Nonetheless, prescribers must also contend with the reality of abuse of street and/or prescription drugs by patients without genuine pain conditions (see Chapter 9). Such patients often request excessive numbers of prescriptions and may also use multiple prescribers and/or pharmacies to get medication. At times, they may also forge prescriptions and/or use a telephone to call in prescriptions for non-Schedule II opioids such as hydrocodone/acetaminophen (Vicodin). Community pharmacists work collaboratively to detect such abuses and notify law enforcement authorities. Creating a phony prescription for a controlled substance is a felony under federal and state laws.

For patients receiving long-acting opioids, breakthrough pain often occurs between doses of pain medications. This is because the analgesic effects wear off as the drug is metabolized and eliminated from the body. Treatment with prn (as needed) doses of immediate-release dosage forms (e.g., oxycodone IR), given between scheduled doses of extended-release dosage forms (e.g., oxycodone ER), is often helpful in these cases. It should be noted that chewing or crushing of any extended-release opioid drug can predispose the patient to oversedation, respiratory depression, and even death due to rapid drug absorption. If the patient is requiring larger doses for breakthrough pain, the dose of the scheduled extended-release opioid may need to be gradually titrated upward or a more potent drug started.

Drugs from other chemical categories are often added to the opioid regimen as adjuvant drugs. These assist the primary drugs in relieving pain. Such adjuvant drug therapy may include NSAIDs (see Chapter 44), antidepresants (see Chapter 17), anticonvulsants (see Chapter 15), and corticosteroids (see Chapter 33), all of which are discussed further in their corresponding chapters. This approach allows the use of smaller dosages of opioids. This reduces some of the adverse effects that are seen with higher dosages of opioids, such as respiratory depression, constipation, and urinary retention. It permits drugs with different mechanisms of action to produce synergistic effects. Antiemetics (see Chapter 52) and laxatives (see Chapter 51) may also be needed to prevent or relieve associated constipation, nausea, and vomiting (Box 11-2).

**BOX 11-2 Potential Opioid Adverse Effects and Their Management**

**Constipation**
Opioids decrease gastrointestinal (GI) tract peristalsis because of their central nervous system (CNS) depression, with subsequent constipation as an adverse effect. Stool becomes excessively dehydrated because it remains in the GI tract longer. Preventative measures: Constipation may be managed with increased intake of fluids, stool softeners such as docusate sodium, and use of mild cathartics such as senna. Less commonly used are bulk-forming laxatives such as psyllium, for which increased fluid intake is especially important to avoid fecal impactions or bowel obstructions.

**Nausea and Vomiting**
Opioids decrease GI tract peristalsis, and some also stimulate the vomiting center in the CNS, so nausea and vomiting are often experienced. Preventative measures: Nausea and vomiting may be managed with the use of antiemetics such as phenothiazines.

**Sedation and Mental Clouding**
Any change in mental status should always be evaluated to ensure that causes other than drug-related CNS depression are ruled out. Preventative measures: Persistent drug-related sedation may be managed with a decrease in the dosage of opioid or change in drug used. The prescriber may also order various CNS stimulants (see Chapter 14).

**Respiratory Depression**
Long-term opioid use is generally associated with tolerance to respiratory depression. Preventative measures: For severe respiratory depression, opioid antagonists may be used to improve respiratory status and, if they are titrated in small amounts, the respiratory depression may be reversed without analgesia reversal.

**Subacute Overdose**
Subacute overdose may be more common than acute respiratory depression and may progress slowly (over hours to days), with somnolence and respiratory depression. Before analgesic dosages are changed or reduced, advancing disease must be considered, especially in the dying patient. Preventative measures: Often, holding one or two doses of an opioid analgesic is enough to judge if the mental and respiratory depression are associated with the opioid. If there is improvement with this measure, the opioid dosage is often decreased by 25%.

**Other Opioid Adverse Effects**
Dry mouth, urinary retention, pruritus, myoclonus, dysphoria, euphoria, sleep disturbances, sexual dysfunction, and inappropriate secretion of antidiuretic hormone may occur but are less common than the aforementioned adverse effects. Preventative measures: Ongoing assessment is needed for each of the adverse effects so that appropriate measures may be implemented (e.g., sucking of sugar-free hard candy or use of artificial saliva drops or gum for dry mouth; use of diphenhydramine for pruritus).

One particularly common use of adjuvant drugs is in the treatment of neuropathic pain. Opioids often are not completely effective in such cases. Neuropathic pain usually results from some kind of nerve damage secondary to disease (e.g., diabetic neuropathy, postherpetic neuralgia secondary to shingles, trigeminal neuralgia, AIDS or injury, including nerve damage secondary to surgical procedures (e.g., postthoracotomy pain syndrome occurring after cardiothoracic surgery). Common symptoms include hypersensitivity or hyperalgesia to mild stimuli such as light touch or a pinprick, or the bed sheets on a person’s feet. This is
also known as *allodynia*. It can also manifest as hyperalgesia to uncomfortable stimuli, such as pressure from an inflated blood pressure cuff on a patient’s limb. It may be described as heat, cold, numbness, tingling, burning, or electrical sensations. Examples of adjuvants commonly used in these cases are the anti-depressant amitriptyline and the anticonvulsants gabapentin and pregabalin.

The three-step analgesic ladder defined by the World Health Organization (WHO) is often applied as the pain management standard for the use of nonopioid and opioid drugs in cancer pain. Examples of nonopioid analgesic drugs include NSAIDs (see Chapter 44) as well as acetaminophen and tramadol (see Drug Profiles). Step 1 is the use of nonopioids (with or without adjuvant medications) once the pain has been identified and assessed. If pain persists and/or increases, treatment moves to step 2, which is defined as the use of opioids with or without nonopioids and with or without adjuvants. Should pain persist or increase, management then rises to step 3, which is the use of opioids indicated for moderate to severe pain, administered with or without nonopioids or adjuvant medications. Many experts now question the effectiveness of Step 2, and the WHO is considering adjusting the ladder.

### Pharmacology Overview

Opioids are classified as both mild agonists (codeine, hydrocodone, and propoxyphene) and strong agonists (morphine, hydromorphine, levorphanol, oxycodone, oxymorphone, meperidine, fentanyl, and methadone). Meperidine is not recommended for long-term use because of the accumulation of a neurotoxic metabolite, normeperidine. In fact, many hospitals have tried to prohibit the use of meperidine, due to its adverse CNS effects, including seizures. The opiate agonists-antagonists such as pentazocine and nalbuphine are associated with an analgesic ceiling effect. This means that the drug reaches a maximum analgesic effect, so that analgesia does not improve even with higher dosages (see Drug Profiles). Such drugs are useful only in patients who have not been previously exposed to opioids and can be administered for management of nonescalating moderate to severe pain. Finally, because of associated bruising and bleeding risks, as well as injection discomfort, there is now a strong trend away from intramuscular injections in favor of intravenous, oral, and transdermal routes of drug administration.

### OPIOID DRUGS

The pain-relieving drugs currently known as opioid analgesics originated from the opium poppy plant. The word *opium* is a Greek word that means “juice.” More than 20 different alkaloids are obtained from the unripe seed of the poppy. The properties of opium and its many alkaloids have been known for centuries. Opium-smoking immigrants brought opium to the United States, where unrestricted availability of opium prevailed until the early twentieth century.

### Chemical Structure

Opioid analgesics are very strong pain relievers. They can be classified according to their chemical structure or their action at specific receptors. Of the 20 different natural alkaloids available from the opium poppy plant, only three are clinically useful: morphine, codeine, and papaverine. Of these, only morphine and codeine are pain relievers; papaverine is a smooth muscle relaxant. Relatively simple synthetic chemical modifications of these opium alkaloids have produced the three different chemical classes of opioids: morphine-like drugs, meperidine-like drugs, and methadone-like drugs (Table 11-4).

#### Table 11-4 Chemical Classification of Opioids

<table>
<thead>
<tr>
<th>Chemical Category</th>
<th>Opioid Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>meperidine-like drugs</td>
<td>meperidine, fentanyl, remifentanil, sufentanil, alfentanil</td>
</tr>
<tr>
<td>methadone-like drugs</td>
<td>methadone, propoxyphene</td>
</tr>
<tr>
<td>morphine-like drugs</td>
<td>morphine, heroin, hydromorphone, oxymorphone, levorphanol, codeine, hydrocodone, oxycodone</td>
</tr>
<tr>
<td>Other</td>
<td>tramadol</td>
</tr>
</tbody>
</table>

#### Table 11-5 Opioid Receptors and Their Characteristics

<table>
<thead>
<tr>
<th>Receptor Type</th>
<th>Prototypical Agonist</th>
<th>Effects of Opioid Stimulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>mu</td>
<td>morphine</td>
<td>Supraspinal analgesia, respiratory depression, euphoria, + + sedation</td>
</tr>
<tr>
<td>kappa</td>
<td>ketocyclazocine</td>
<td>Spinal analgesia, + + + + sedation, miosis</td>
</tr>
<tr>
<td>delta</td>
<td>Enkephalins</td>
<td>Analgesia</td>
</tr>
</tbody>
</table>

#### Mechanism of Action and Drug Effects

Opioid analgesics can also be characterized according to their mechanism of action. They can be agonists, agonists-antagonists, or antagonists (nonanalgesic). An *agonist* binds to an opioid pain receptor in the brain and causes an analgesic response—the reduction of pain sensation. An *agonist-antagonist*, also called a *partial agonist* or a *mixed agonist*, binds to a pain receptor but causes a weaker pain response than a full agonist. Different drugs in this class exert their agonist and/or antagonist effects by binding in different degrees to kappa and mu opioid receptors. Although not normally used as first-line analgesics, they are sometimes useful in pain management in opioid-addicted patients as well as obstetrical patients (because they avoid oversedation of the mother and/or fetus). An *antagonist* binds to a pain receptor but does not reduce pain signals. It functions as a *competitive antagonist* because it competes with and reverses the effects of agonist and agonist-antagonist drugs at the receptor sites.

The actual receptors to which opioids bind to relieve pain are listed and their characteristics are summarized in Table 11-5. Although five types of opioid receptor have been identified to date: mu (µ), kappa (κ), sigma (σ), delta (δ), and epsilon (ε), the mu, kappa, and delta receptors are the most responsive to drug activity with the mu being the most important. Many of the characteristics of a particular opioid, such as its ability to sedate, its potency, and its ability to cause hallucinations, can be attributed to relative affinity for these various receptors.
An understanding of the relative potencies of various drugs becomes important in clinical settings. *Equianalgesia* refers to the ability to provide equivalent pain relief by calculating dosages of different drugs and/or routes of administration that provide comparable analgesia. Box 11-3 lists equianalgesic doses for several common opioids and shows how to calculate dosage conversions for patients. Because fentanyl is most commonly used transdermally, it is discussed separately in its drug profile.

**Indications**

The main use of opioids is to alleviate moderate to severe pain. The degree to which pain is relieved or unwanted adverse effects occur depends on the specific drug, the receptors to which it binds, and its chemical structure.

Strong opioid analgesics such as fentanyl, sufentanil, and alfentanil are commonly used in combination with anesthetics during surgery. These drugs are used not only to relieve pain but also to maintain a balanced state of anesthesia. The practice of using combinations of drugs to produce anesthesia is referred to as *balanced anesthesia* (see Chapter 12). Use of fentanyl injection for management of postoperative and procedural pain has become popular due to its rapid onset and short duration. Transdermal fentanyl comes in a patch formulation for use in long-term pain management and should not be used for postoperative or any other short-term pain control (see the Preventing Medication Errors box).

Strong opioids such as morphine, meperidine, hydromorphone, and oxycodone are often used to control postoperative and other types of pain. Because morphine and hydromorphone

### BOX 11-3 Calculating Dosage Conversions Between Commonly Used Opioids

**Basic Conversion Equation:**

\[
\frac{24 \text{ hr amount of current drug}}{X} = \frac{\text{EA dose of current drug}}{\text{EA dose of desired drug}}
\]

Where \(X = \text{amount of desired opioid in 24 hours and EA} = \text{equianalgesic dose obtained from table above}\

**Step 1:** Determine 24 hour amount of oxycodone taken by this patient:

80 mg × 2 doses per 24 hours = 160 mg per 24 hours

**Step 2:** Using the conversion table above, find the equianalgesic (EA) doses of oxycodone and parenteral morphine:

15 mg oxycodone = 10 mg parenteral morphine

**Step 3:** Use above equation and solve for \(X\) by cross multiplying.

\[
\frac{24 \text{ hr amount of oxycodone (160 mg)}}{X} = \frac{\text{EA of current oxycodone (15 mg)}}{\text{EA dose of parenteral morphine (10 mg)}}
\]

Where \(X = \text{amount of parenteral morphine in 24 hours (solve by cross multiplying)}\

\[
160 \text{ mg} \times 10 \text{ mg} = 15 \text{ mg} \times \frac{1600 \text{ mg}}{15 \text{ mg}} \\
X = 107 \text{ mg (approximately 100 mg of injectable morphine per 24 hours)}
\]
Adverse Effects

Many of the unwanted effects of opioid analgesics are related to their effects on parts of the body other than the CNS. Some of these unwanted effects can be explained by the respective drug’s selectivity for the receptors listed in Table 11-5. The various body systems that the opioids affect and their specific adverse effects are summarized in Table 11-6.

Opioids that have an affinity for mu receptors and have rapid onset of action produce marked euphoria. These are the opioids that are most likely to be abused and used recreationally. All opioid drugs have a strong abuse potential. They are common recreational drugs of abuse among the lay public and also among health care professionals, who often have relatively easy access. The person taking them to alter his or her mental status will soon become psychologically dependent (addicted; see Chapter 9).

In addition, opioids do cause some histamine release. It is thought that this histamine release is responsible for many of the drugs’ unwanted adverse effects, such as itching or pruritus, rash, and hemodynamic changes. The histamine release causes peripheral arteries and veins to dilate, which leads to flushing and orthostatic hypotension. The amount of histamine release that an opioid analgesic causes is related to its chemical class. The naturally occurring opiates (e.g., morphine) elicit the most histamine release; the synthetic opioids (e.g., meperidine) elicit the least histamine release. (See Table 11-4 for a list of the various opioids and their respective chemical classes.)

The most serious adverse effect of opioid use is CNS depression, which may lead to respiratory depression. When death occurs from opioid overdose, it is almost always due to respiratory depression. When opioids are given, care should be taken to titrate the dose so that the patient’s pain is controlled without respiratory function’s being affected. Individual responses to opioids vary, and patients may occasionally experience respiratory compromise despite careful dose titration. Respiratory depression can be prevented in part by using drugs with very short duration of action and no active metabolites. Respiratory depression seems to be more common in patients with a preexisting condition causing respiratory compromise, such as asthma or chronic obstructive pulmonary disease. Respiratory depression is strongly related to the degree of sedation (see Toxicity and Management of Overdose later).

GI tract adverse effects are common in patients receiving opioids, due to stimulation of GI opioid receptors as noted previously. Nausea, vomiting, and constipation are the most common adverse effects associated with opioid analgesics. Opioids can

### Table 11-6: Opioid-Induced Adverse Effects by Body System

<table>
<thead>
<tr>
<th>Body System</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Hypotension, palpitations, flushing, bradycardia</td>
</tr>
<tr>
<td>Central nervous</td>
<td>Sedation, disorientation, euphoria, lightheadedness, dysphoria, lowered seizure threshold, tremors</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Nausea, vomiting, constipation, biliary tract spasm</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>Urinary retention</td>
</tr>
<tr>
<td>Integumentary</td>
<td>Itching, rash, wheal formation</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Respiratory depression and possible aggravation of asthma</td>
</tr>
</tbody>
</table>

For further information on transdermal fentanyl, visit [http://www.ismp.org/Newsletters/acuteacare/articles/20050811.asp](http://www.ismp.org/Newsletters/acuteacare/articles/20050811.asp).
irritate the GI tract, stimulating the chemoreceptor trigger zone in the CNS, which in turn may cause nausea and vomiting. Opioids slow peristalsis and increase absorption of water from intestinal contents. These two actions combine to produce constipation. This is more pronounced in hospitalized patients who are nonambulatory. Patients may require laxatives (Chapter 51) to help maintain normal bowel movements.

Urinary retention, or the inability to void, is another unwanted adverse effect of opioid analgesics, caused by increasing bladder tone. This is sometimes prevented by giving low dosages of an opioid agonist-antagonist or an opioid antagonist or a cholinergic agonist (see Chapter 20), such as bethanechol.

Severe hypersensitivity or anaphylactic reaction to opioid analgesics is rare. Many patients will experience GI discomforts or histamine-mediated reactions to opioids and call these “allergic reactions.” However, true anaphylaxis is rare, even with intravenously administered opioids. Some patients may complain of flushing, itching, or wheal formation at the injection site, but this is usually local and histamine mediated, and not a true allergy. Box 11-2 provides additional information on opioid adverse effects and their management.

### Toxicity and Management of Overdose

Opioid analgesics produce both beneficial and toxic effects. The opioid antagonists naloxone and naltrexone bind to and occupy all of the receptor sites (mu, kappa, delta). They are competitive antagonists with a strong affinity for these binding sites. Through such binding they can reverse the adverse effects induced by the opioid drug, such as respiratory depression. These drugs are used in the management of both opioid overdose and opioid addiction. The commonly used opioid antagonists (reversal drugs) are listed in Table 11-7.

When treating an opioid overdose or toxicity, the nurse must recognize the signs and symptoms of withdrawal. Some degree of physical dependence is expected in opioid-tolerant patients. The extent of opioid tolerance is most visible when an opioid is administered. This usually leads to symptoms of opioid withdrawal, also known as abstinence syndrome (see Chapter 9). This can occur after as little as 2 weeks of opioid therapy in opioid-naive patients. Gradual dosage reduction after chronic opioid use, when possible, generally helps to minimize the risk and severity of withdrawal symptoms. Regardless of withdrawal symptoms, when a patient experiences severe respiratory depression, naloxone (an opioid antagonist) should be given.

Respiratory depression is the most serious adverse effect associated with opioids. Stimulation of the patient may be adequate to reverse mild hypoventilation. If this is unsuccessful, ventilatory assistance using a bag and mask or endotracheal intubation may be needed to support respiration. Administration of opioid antagonists (e.g., naloxone) may also be necessary to reverse severe respiratory depression. Careful titration of drug dose until the patient begins to breathe independently will prevent overrespiration. The effects of naloxone are short lived and usually last about 1 hour. With long-acting opioids, respiratory depressant effects may reappear, and redosing of naloxone may be needed.

The timing of the onset of withdrawal symptoms is directly related to the half-life of the opioid analgesic being used. The withdrawal symptoms resulting from the discontinuance or reversal of therapy with short-acting opioids (codeine, hydrocodone, morphine, and hydromorphone) will appear within 6 to 12 hours and peak at 24 to 72 hours. The withdrawal symptoms associated with the long half-life drugs (methadone, levorphanol, and transdermal fentanyl) may not appear for 24 hours or longer after drug discontinuation and may be milder.

### Interactions

Potential drug interactions with opioids are significant. Coadministration of opioids with alcohol, antihistamines, barbiturates, benzodiazepines, phenothiazine, and other CNS depressants can result in additive respiratory depressant effects. The combined use of opioids (such as meperidine) with monoamine oxidase inhibitors can result in respiratory depression, seizures, and hypotension.

### Laboratory Test Interactions

Opioids can cause an abnormal increase in the serum levels of amylase, alanine aminotransferase, alkaline phosphatase, bilirubin, lipase, creatinine kinase, and lactate dehydrogenase. Other abnormal results include a decrease in urinary 17-ketosteroid levels and an increase in the urinary alkaloid and glucose concentrations.

### Dosages

For the recommended initial dosages of selected analgesic drugs in opioid-naive patients, see the Dosages table on p. 162.

### Table 11-7 Opioid Antagonists (Reversal Drugs)

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Dosage</th>
<th>Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>naloxone (IV)</td>
<td>Narcan</td>
<td>0.4-2 mg q2-3min (not more than 10 mg); IV infusion: 2 mg in 500 mL (titrate to response)</td>
<td>Raised or lowered blood pressure, dysrhythmias, pulmonary edema, withdrawal</td>
</tr>
<tr>
<td>naltrexone (PO)</td>
<td>ReVia</td>
<td>25-50 mg daily</td>
<td>Nervousness, headache, nausea, vomiting, pulmonary edema, withdrawal</td>
</tr>
</tbody>
</table>

IV, Intravenous; PO, oral.
## DOSAGES

### Selected Analgesic Drugs and Related Drugs

<table>
<thead>
<tr>
<th>Drug (Pregnancy Category)</th>
<th>Pharmacologic Class</th>
<th>Usual Dosage Range</th>
<th>Indications/Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>codeine sulfate (D)</td>
<td>Opiate analgesic; opium alkaloid</td>
<td><strong>Pediatric 2-5 yr</strong>&lt;br&gt;PO/subcut/IM: 2.5-5 mg q4-6h—do not exceed 30 mg/day</td>
<td>Cough relief</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Pediatric 6-11 yr</strong>&lt;br&gt;5-10 mg q4-6h</td>
<td>Cough relief</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Adult and pediatric older than 12 yr</strong>&lt;br&gt;10-20 mg q4-6h—do not exceed 120 mg/day</td>
<td>Cough relief</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Adult</strong>&lt;br&gt;15-60 mg tid-qid</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td>fentanyl citrate (Duragesic, Oralet, Actiq*) (D)</td>
<td>Opioid analgesic</td>
<td>All doses titrated to response, starting with lowest effective dose</td>
<td>Procedural sedation or adjunct to general anesthesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV/IM doses available in 50 mcg/mL ampule or premixed infusion of varying strengths</td>
<td>Relief of moderate to severe acute pain; relief of chronic pain, including cancer pain</td>
</tr>
<tr>
<td>meperidine HCl (Demerol, Pethidine) (D)</td>
<td>Opioid analgesic</td>
<td><strong>Pediatric</strong>&lt;br&gt;PO/IM/subcut: 1.1-1.8 mg/kg q3-4h prn (max 100 mg/dose)</td>
<td>Meperidine use should be restricted because of the unpredictable effects of neurometabolites at analgesic doses and risk for seizures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IM/subcut: 0.5-1 mg/kg 30-90 min before anesthesia (max 600 mg/day)</td>
<td>Obstetric analgesia, preoperative sedation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Adult</strong>&lt;br&gt;PO/IM/subcut: 50-150 mg q3-4h prn</td>
<td>Obstetric analgesia, preoperative sedation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IM/subcut: 50-100 mg 30-90 min before anesthesia</td>
<td>Obstetric analgesia, preoperative sedation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV: 50-150 mg q3-4h</td>
<td>Obstetric analgesia, preoperative sedation</td>
</tr>
<tr>
<td>methadone HCl (Dolophine) (D)</td>
<td>Opioid analgesic</td>
<td><strong>Adult</strong>&lt;br&gt;PO/IM/IV/subcut: 2.5-10 mg q3-4h; 40 mg or more once daily</td>
<td>Opioid analgesia, relief of chronic pain, opioid detoxification, opioid addiction maintenance</td>
</tr>
<tr>
<td>morphine sulfate (MSIR, Roxanol, Kadian, Avinza, others) (D)</td>
<td>Opiate analgesic; opium alkaloid</td>
<td><strong>Pediatric</strong>&lt;br&gt;Subcut: 0.1-0.2 mg/kg dose—do not exceed a 15-mg single dose</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Adult</strong>&lt;br&gt;PO/IM/subcut: 5-30 mg q4h</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PR: 10-20 mg q4h</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IV: 2.5-20 mg q2-6h</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCA pump, epidural: titrate to effect</td>
<td>Opioid analgesia</td>
</tr>
<tr>
<td>morphine sulfate, continuous release (MS Contin, Oramorph) (D)</td>
<td>Opiate analgesic; opium alkaloid</td>
<td><strong>Adult only</strong>&lt;br&gt;PO: 15 mg q8h to 200 mg q 8-12h</td>
<td>Relief of moderate to severe pain</td>
</tr>
<tr>
<td>oxycodone, immediate release (OxyR) (D)</td>
<td>Opioid, synthetic</td>
<td><strong>Pediatric</strong>&lt;br&gt;PO: 1.25-2.5 mg q6h prn</td>
<td>Relief of moderate to severe pain</td>
</tr>
<tr>
<td>oxycodone, continuous release (OxyContin) (D)</td>
<td>Opioid, synthetic</td>
<td><strong>Adult</strong>&lt;br&gt;PO: 5-20 mg q4-6h prn</td>
<td>Relief of moderate to severe pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Adult only</strong></td>
<td>Relief of moderate to severe pain</td>
</tr>
</tbody>
</table>

HCl, Hydrochloride; IM, intramuscular; IV, intravenous; IR, immediate release; MS, morphine sulfate; MSIR, morphine sulfate immediate release; PCA, patient-controlled analgesia; PO, oral; PR, rectal; subcut, subcutaneous.

*Actiq is not approved for use in patients under the age of 16.
CHAPTER 11  Analgesic Drugs

DOSAGES

Selected Analgesic Drugs and Related Drugs—cont’d

<table>
<thead>
<tr>
<th>Drug (Pregnancy Category)</th>
<th>Pharmacologic Class</th>
<th>Usual Dosage Range</th>
<th>Indications/Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nonopioids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acetaminophen†</td>
<td>Nonopioid analgesic, antipyretic</td>
<td>PO/PR: Variable doses by age from 40 to 480 mg q4-6h</td>
<td>Mild to moderate pain relief</td>
</tr>
<tr>
<td>(Tylenol, others) (B)</td>
<td></td>
<td>Adult</td>
<td>Relief of mild to moderate pain</td>
</tr>
<tr>
<td>tramadol (Ultram)</td>
<td>Nonopioid analgesic (with opioid-like activity)</td>
<td>Adult</td>
<td>Relief of moderate to moderately severe pain</td>
</tr>
</tbody>
</table>

| **Opioid Antagonists**     |                     |                    |                  |
| naloxone HCl (Narcan)      | Opioid antagonist   | Pediatric | IV 0.01 mg/kg IV followed by 0.1 mg/kg if needed; 0.0005-0.01 mg/kg IV—repeat at 2-3 min intervals |
|                           |                     | Adult | IV 0.4-2 mg IV—repeat in 2-8 min if needed; 0.1-0.2 mg IV—repeat at 2-3 min intervals |
| naltrexone HCl (Trexan)    | Opioid antagonist   | Adult | PO: 50 mg q24h or 100 mg every other day |

†The maximum recommended daily dose of acetaminophen for a typical adult patient with normal liver function is 4000 mg/24 hr. For hepatically compromised patients, this dosage may be 2000 mg or even lower. If in doubt, check with a pharmacist or prescriber regarding a particular patient.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Onset of Action</th>
<th>Peak Plasma Concentration</th>
<th>Elimination Half-life</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>codeine sulfate</td>
<td>IM</td>
<td>Rapid</td>
<td>30-60 min</td>
<td>1.7-4.5 hr</td>
<td>6-7 hr</td>
</tr>
</tbody>
</table>

10% of a codeine dose is metabolized to morphine in the body. However, codeine is less effective as an analgesic and is the only agonist to possess a ceiling effect. Therefore it is more commonly used as an antitussive drug in an array of cough preparations. Codeine combined with acetaminophen (tablets or elixir) is classified as a Schedule III controlled substance and is commonly used for control of mild to moderate pain as well as cough. When codeine is not combined with other drugs, it is classified as a Schedule II controlled substance, which implies a high abuse potential. Codeine causes GI tract upset, and, as noted earlier, many patients will say they are allergic to codeine, when in fact it just upsets their stomach. For dosage information, see the table on p. 162.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Route</th>
<th>Onset of Action</th>
<th>Peak Plasma Concentration</th>
<th>Elimination Half-life</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>fentanyl</td>
<td>PO</td>
<td>15-30 min</td>
<td>34-45 min</td>
<td>2.5-4 hr</td>
<td>4-6 hr</td>
</tr>
</tbody>
</table>

Fentanyl is a synthetic opioid (Schedule II) used to treat moderate to severe pain. Like other opioids, it also has a high abuse potential. It is available in several dosage forms: parenteral injections (Sublimaze), transdermal patches (Duragesic), buccal lozenges (Fentora), and buccal lozenges on a stick or “lollipop” (Actiq). The buccal dosage forms are absorbed through the oral mucosa and are not “oral” dosage forms per se. They may be especially helpful in managing breakthrough and procedural pain. The injectable form is used most commonly in perioperative settings and in intensive care unit settings for sedation during mechanical ventilation. The oral and transdermal forms are used primarily for long-term control of both malignant and nonmalignant chronic pain. Fentanyl is a very potent analgesic. Fentanyl at a dose of 0.1 mg given intravenously is roughly equivalent to 10 mg of morphine given intravenously.

**PHARMACOKINETICS**
PHARMACOKINETICS

Route | Onset of Action | Peak Plasma Concentration | Elimination Half-life | Duration of Action
--- | --- | --- | --- | ---
IV | Rapid | Minutes | 1.5-6 hr | 30-60 min
Transdermal | 12-24 hr | 48-72 hr | Delayed | 13-40 hr
PO | 5-15 min | 20-30 min | 5-15 hr | Unknown

methadone hydrochloride
Methadone hydrochloride (Dolophine) is a synthetic opioid analgesic (Schedule II). It is the opioid of choice for the detoxification treatment of opioid addicts in methadone maintenance programs. Use of agonist-antagonist opioids (e.g., pentazocine) in heroin-addicted patients or those in methadone maintenance programs can induce significant withdrawal symptoms. There has been renewed interest in the use of methadone for chronic (e.g., neuropathic) and cancer-related pain. The drug is readily absorbed through the GI tract with peak plasma concentrations at 4 hours for single dosing. Methadone is unique in that its half-life is longer than its duration of activity and it is bound into the tissues of the liver, kidneys and brain. With repeated doses, the drug accumulates in those tissues and is slowly released, thus allowing for 24 hour dosing. Methadone is eliminated through the liver, which makes it a safer choice than some other opioids for patients with renal impairment. Recent FDA reports have cited the prolonged half-life of the drug as a cause of unintentional overdoses and deaths. There is also concern that methadone may cause cardiac dysrythmias. Methadone is available in oral and injectable forms. For dosage information, see the table on p. 162.

PHARMACOKINETICS

Route | Onset of Action | Peak Plasma Concentration | Elimination Half-life | Duration of Action
--- | --- | --- | --- | ---
PO | 30-60 min | 1.5-2 hr | 25 hr | 22-48 hr

Oxycodeone hydrochloride
Oxycodeone hydrochloride is an analgesic drug that is structurally related to morphine and has comparable analgesic activity (Schedule II). It is also commonly combined in tablets with acetaminophen (Percocet) and with aspirin (Percodan). Oxycodeone is also available in immediate-release formulations (Oxy IR) and sustained-release formulations (OxyContin). A somewhat weaker but commonly used opioid is hydrocodone (Schedule III), which is available only in tablet form, most commonly in combination with acetaminophen (Vicodin) but also with aspirin and ibuprofen. It is available only for oral use. For dosage information, see the table on p. 162.

PHARMACOKINETICS (IMMEDIATE RELEASE)

Route | Onset of Action | Peak Plasma Concentration | Elimination Half-life | Duration of Action
--- | --- | --- | --- | ---
PO | 10-15 min | 1 hr | 2-3 hr | 3-6 hr

OPIOID AGONISTS-ANTAGONISTS
Opioids with mixed actions are often called agonists-antagonists (Schedule IV). They bind to the μ receptor and can therefore compete with other substances for these sites. They either exert no action (i.e., they are competitive antagonists) or have only limited action (i.e., they are partial agonists). They are similar to the agonist opioid drugs in terms of their therapeutic indications; however, they have a lower risk of misuse and addiction. The antagonist activity of this group can produce withdrawal symptoms in opioid-dependent patients. Their use is contraindicated in patients who have shown hypersensitivity reactions to the drugs.

Opioid agonist-antagonists have varying degrees of agonist and antagonist effects on the different opioid receptor subtypes. These drugs are normally used in situations requiring short-term pain control, such as after obstetric procedures. They are sometimes chosen for patients who have a history of opioid addiction. These medications can both help prevent overmedication and reduce posttreatment addictive cravings in these patients. These drugs are normally not strong enough for management of longer-term chronic pain.

The transdermal delivery system (patch) has been shown to be highly effective in the treatment of various chronic pain syndromes such as cancer-induced pain, especially in patients who cannot take oral medications. This route should not be used in opioid-naive patients. Generally, fentanyl patches are best used for non-escalating pain because of the difficulty of titrating doses. To perform a conversion using the table in Box 11-3, first the daily (24-hour) opioid requirement of the patient should be determined. Second, if the opioid is not morphine, its dose should be converted to the equianalgesic dose of morphine using Box 11-3. Finally, the equipotent transdermal fentanyl dosage is calculated. These tables are conservative in their dosages for achieving pain relief, and supplemental short-acting opioid analgesics should be added as needed.

Nurses should also be aware that after the first patch is applied it will take 6 to 12 hours to reach steady-state pain control again, so that supplemental short-acting therapy is required. Most patients will experience adequate pain control for 72 hours with this method of fentanyl delivery. A new patch should be applied every 72 hours. It is important to remove the old patch when applying a new one. It should also be noted that it takes about 17 hours for the amount of fentanyl to reduce by 50% once the patch is removed.

In 2006, and again in 2007, the U.S. Food and Drug Administration (FDA) released safety warnings about the use of fentanyl patches. Fentanyl patches are intended for management of chronic or cancer pain in opioid-tolerant patients whose pain is not adequately controlled by other types of medications. These patches are not recommended for acute pain situations such as postoperative pain. Deaths have occurred from drug-induced respiratory arrest when these conditions have not been met. According to the FDA, patients who are considered opioid tolerant are those who have been taking at least 60 mg of oral morphine daily or at least 30 mg of oral oxycodone daily or at least 8 mg of oral hydromorphone daily or an equianalgesic dose of another opioid. Other hazards associated with the use of fentanyl patches are cutting the patch and exposing the patch to heat (e.g., via a heating pad or sauna), both of which accelerate the diffusion of the drug into the patient’s body.

For dosage information, see the table on p. 162.

PHARMACOKINETICS

Route | Onset of Action | Peak Plasma Concentration | Elimination Half-life | Duration of Action
--- | --- | --- | --- | ---
IM | Rapid | 30-60 min | 3-5 hr | 2-4 hr

meperidine hydrochloride
Meperidine hydrochloride (Demerol) is a synthetic opioid analgesic (Schedule II). Meperidine should be used with caution, if at all, in elderly patients and in patients who require long-term analgesia or who have kidney dysfunction. An active metabolite, normeperidine, can accumulate to toxic levels and lead to seizures. For this reason, meperidine is now used less commonly than before and is definitely not recommended for long-term pain treatment. However, it is still used for acute pain during postoperative periods, as well as in emergency department settings for acute migraine headaches. Meperidine is available in oral and injectable forms. For dosage information, see the table on p. 162.
(e.g., cancer pain, chronic lower back pain). They should also not be given concurrently with full opioid agonists, because they may both reduce analgesic effects and cause withdrawal symptoms in opioid-tolerant patients. Four opioid agonists-antagonists are currently available: buprenorphine (Buprenex), butorphanol (Stadol), nalbuphine (Nubain), and pentazocine (Talwin). They are available in various oral, injectable, and intranasal dosage forms as indicated in the dosage table. All except butorphanol are also available in combination with the opioid antagonist naloxone to enhance their opioid antagonistic effects, which are usually weaker than the agonistic effects of these drugs.

**OPIOID ANTAGONISTS**

Opioid antagonists produce their antagonistic activity by competing with opioids for CNS receptor sites.

- **Naloxone hydrochloride**
  Naloxone hydrochloride (Narcan) is a pure opioid antagonist because it possesses no agonistic morphine-like properties and works as a blocking drug for the opioid drugs. Accordingly, the drug does not produce analgesia or respiratory depression. Naloxone is the drug of choice for the complete or partial reversal of opioid-induced respiratory depression. It is also indicated in cases of suspected acute opioid overdose. Failure of the drug to significantly reverse the effects of the presumed opioid overdose indicates that the condition may not be related to opioid overdose. The primary adverse effect is opioid withdrawal syndrome, which can occur with abrupt reversal in opioid-tolerant patients. Naloxone is available only in injectable dosage forms. Use of the drug is contraindicated in patients with a history of hypersensitivity to it. For dosage information, see the table on p. 162.

**PHARMACOKINETICS**

<table>
<thead>
<tr>
<th>Route</th>
<th>Onset of Action</th>
<th>Peak Plasma Concentration</th>
<th>Elimination Half-life</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>Less than 2 min</td>
<td>Rapid</td>
<td>64 min</td>
<td>0.5-2 hr</td>
</tr>
</tbody>
</table>

- **Naltrexone hydrochloride**
  Naltrexone hydrochloride (ReVia) is an opioid antagonist used as an adjunct for the maintenance of an opioid-free state in former opioid addicts. The FDA has identified it as a safe and effective adjunct to psychosocial treatments of alcoholism. It is also indicated for reversal of postoperative opioid-induced respiratory depression. Nausea and tachycardia are the most common adverse effects and are related to reversal of the opioid effect. Use of naltrexone hydrochloride is contraindicated in cases of known drug allergy and in patients with hepatitis or other severe liver dysfunction. It is available only for oral use. For dosage information, see the table on p. 162.

**PHARMACOKINETICS**

<table>
<thead>
<tr>
<th>Route</th>
<th>Onset of Action</th>
<th>Peak Plasma Concentration</th>
<th>Elimination Half-life</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO</td>
<td>Rapid</td>
<td>1 hr</td>
<td>4-13 hr</td>
<td>24-72 hr</td>
</tr>
</tbody>
</table>

**NONOPIOID AND MISCELLANEOUS ANALGESICS**

The most widely used nonopioid analgesic is acetaminophen. All drugs in the NSAID class, which includes aspirin, and the cyclooxygenase-2 (COX-2) inhibitors (e.g., Celebrex) are also nonopioid analgesics, and these drugs are discussed in greater detail in Chapter 44. These medications are commonly used for management of pain, especially pain associated with inflammatory conditions such as arthritis, because they have significant antiinflammatory effects in addition to their analgesic effects. Miscellaneous analgesics include tramadol and transdermal lidocaine. They are discussed in depth in their respective drug profiles.

**Mechanism of Action and Drug Effects**

The mechanism of action of acetaminophen is similar to that of the salicylates. It blocks peripheral pain impulses by inhibition of prostaglandin synthesis. Acetaminophen also lowers febrile body temperatures by acting on the hypothalamus, the structure in the brain that regulates body temperature. Heat is dissipated through resulting vasodilation and increased peripheral blood flow. In contrast to NSAIDs, acetaminophen lacks antiinflammatory effects. Although acetaminophen shares the analgesic and antiinflammatory effects of the salicylates and other NSAIDs, it does not have many of the unwanted effects of these drugs. For example, acetaminophen products are not usually associated with cardiovascular effects (e.g., edema) or platelet effects (e.g., bleeding) as do aspirin and other NSAIDs. They also do not cause the aspirin-related GI tract irritation or bleeding nor any of the aspirin-related acid-base changes.

**Indications**

Acetaminophen is indicated for the treatment of mild to moderate pain and fever. It is an appropriate substitute for aspirin because of its analgesic and antipyretic properties. Acetaminophen is a valuable alternative for those patients who cannot tolerate aspirin or for whom aspirin may be contraindicated.

Acetaminophen is also the antipyretic (antifever) drug of choice in children and adolescents with flu syndromes, because the use of aspirin in such populations is associated with a condition known as Reye’s syndrome.

**Contraindications**

Contraindications to acetaminophen use include known drug allergy, severe liver disease, and the genetic disease known as glucose-6-phosphate dehydrogenase deficiency.

**Adverse Effects**

Acetaminophen is generally well tolerated and is therefore available over the counter (OTC) and in many combination prescription drugs. Possible adverse effects include rash, nausea, and vomiting. Much less common but more severe are the adverse effects of blood disorders or dyscrasias (e.g., anemias) and nephrotoxicities, and, of most concern, hepatotoxicity.

**Toxicity and Management of Overdose**

Many people do not realize that acetaminophen, despite its OTC status, is a potentially lethal drug when taken in overdose. Depressed patients (especially adolescents) may intentionally overdose on the drug as an attention-seeking gesture without realizing the grave danger involved.

The ingestion of large amounts of acetaminophen, as in acute overdose, or even chronic unintentional misuse can cause hepatic necrosis. Acute ingestion of acetaminophen doses of 150 mg/kg or more may result in hepatic toxicity. Acute hepatic toxicity can usually be reversed with acetylcysteine, where as long-term toxicity is more likely to be permanent.

The standard maximum daily dose of acetaminophen for healthy adults is 4000 mg. However, limitation to 2000 mg or less...
may be necessary for patients with risk factors such as advanced age (elderly) or liver dysfunction. Excessive dosing may also occur inadvertently with the use of combination drug products such as tablets that include a fixed ratio of an opioid drug plus acetaminophen (e.g., hydrocodone plus acetaminophen). Prescribers should be mindful of recommended daily dose limits when prescribing these medications.

The long-term ingestion of large doses of acetaminophen is more likely to result in severe hepatotoxicity, which may be irreversible. Because the reported or estimated quantity of drug ingested is often inaccurate and not a reliable guide to the therapeutic management of the overdose, serum acetaminophen concentration should be determined for this purpose no sooner than 4 hours after the ingestion. If a serum acetaminophen level cannot be determined, it should be assumed that the overdose is potentially toxic and treatment with acetylcysteine, the recommended antidote for acetaminophen toxicity, should be started. Acetylcysteine works by preventing the hepatotoxic metabolites of acetaminophen from forming. It is most effective when given within 10 hours of an overdose. Historically, the usual dosage regimen is a 140 mg/kg oral loading dose, followed by 70 mg/kg every 4 hours for 17 additional doses. This drug is notoriously bad tasting with an odor of rotten eggs, and vomiting of an oral dose is common. It is recommended that the dose be repeated if vomiting occurs within 1 hour of dosing. An intravenous dosage formulation of acetylcysteine (Acetadote) is also available. This is given in three intravenous doses of 150 mg/kg, 50 mg/kg, and 100 mg/kg over a 21-hour period.

**Interactions**

A variety of substances can interact with acetaminophen. Alcohol is potentially the most dangerous. Chronic heavy alcohol abusers may be at increased risk of liver toxicity from excessive acetaminophen use. For this reason, a maximum daily dose of 2000 mg is generally recommended for these persons. Health care professionals should alert patients with regular intake of moderate to large amounts of alcohol not to exceed recommended dosages of acetaminophen because of the risk of liver dysfunction and possible liver failure. Ideally, alcohol consumption should not exceed three drinks daily. Other hepatotoxic drugs should also be avoided. Other drugs that potentially can interact with acetaminophen include phenytoin, barbiturates, warfarin, isoniazid, rifampin, beta-blockers, and anticholinergic drugs, all of which are discussed in greater detail in later chapters.

**Drug Profiles**

◆ **acetaminophen**

Acetaminophen (Tylenol) is an effective and relatively safe nonopioid analgesic used for mild to moderate pain relief. It is contraindicated in patients with a hypersensitivity to it or intolerance to tartrazine (yellow dye no. 5), alcohol, sugar, or saccharin. Its use should be avoided in patients who are anemic or who have renal or hepatic disease. Acetaminophen is available in oral and rectal dosage forms. Repetitive acetaminophen dosing can also inhibit warfarin metabolism. Acetaminophen is also a component of several prescription combination drug products, including hydrocodone/acetaminophen (Vicodin) and oxycodone/acetaminophen (Percocet). Acetaminophen liquid is available in two different concentrations: infant drops contain 80 mg/0.8 mL, whereas acetaminophen liquid contains 160 mg/5 mL. It is very important for the nurse to specify which product is to be used. It is also important to discuss the amount needed in milligrams, not milliliters. For example, if a child is to receive 160 mg and the parent is told to give 5 mL, then if the parent uses the infant drops, that 5 mL would contain 500 mg versus 160 mg for the liquid. This difference could provide a fatal dose.

**PHARMACOKINETICS**

<table>
<thead>
<tr>
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<th>Onset of Action</th>
<th>Peak Plasma Concentration</th>
<th>Elimination Half-life</th>
<th>Duration of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO</td>
<td>10-30 min</td>
<td>0.5-2 hr</td>
<td>1-4 hr</td>
<td>3-4 hr</td>
</tr>
</tbody>
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**tramadol hydrochloride**

Tramadol hydrochloride (Ultram) is categorized as a miscellaneous analgesic due to its unique properties. It is a centrally acting analgesic with a dual mechanism of action. It creates a weak bond to the mu opioid receptors and inhibits the reuptake of both norepinephrine and serotonin. Although it does have weak opioid receptor activity, tramadol is not currently classified as a controlled substance. Tramadol is indicated for the treatment of moderate to moderately severe pain. Tramadol is rapidly absorbed, and its absorption is unaffected by food. It is metabolized in the liver to an active metabolite and eliminated via renal excretion. Adverse effects are similar to those of opioids and include drowsiness, dizziness, headache, nausea, constipation, and respiratory depression. Seizures have been reported in patients taking tramadol and occur in patients taking both normal and excessive dosages. Patients who may be at risk are those receiving tricyclic antidepressants, selective serotonin reuptake inhibitor antidepressants (SSRIs), monoamine oxidase inhibitors, neuroleptics, or other drugs that reduce the seizure threshold. There is also an increased risk of developing serotonin syndrome when tramadol is taken concurrently with SSRIs (see Chapter 17).

Use of the drug is contraindicated in cases of known drug allergy, which may include allergy to opioids due to potential cross-reactivity. It is also contraindicated in cases of acute intoxication with alcohol, hypnotics, centrally acting analgesics, opioids, or psychotropic drugs. The drug is only available in oral dosage forms, including a newer combination with acetaminophen (Ultracet).

**PHARMACOKINETICS**

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>PO</td>
<td>30 min</td>
<td>2 hr</td>
<td>5-8 hr</td>
<td>6 hr</td>
</tr>
</tbody>
</table>

**lidocaine, transdermal**

Transdermal lidocaine is a topical anesthetic (see Chapter 12) and cardiac antidysrhythmic (see Chapter 23) that is formulated into a patch (Lidoderm), which is placed onto painful areas of the skin. It is indicated for the treatment of postherpetic neuralgia, a painful skin condition that remains after a skin outbreak of shingles. Shingles is caused by the herpes zoster virus, also known as the varicella-zoster virus, which causes chickenpox in children. Lido
caine patches provide local pain relief, and up to three patches may be placed on a large painful area. However, the patches should not be worn for longer than 12 hours a day to avoid potential systemic drug toxicity (e.g., cardiac dysrhythmias). Because they act topically, there are minimal systemic adverse effects. However, the skin at the site of treatment may develop redness or edema, and unusual skin sensations may occur. These reactions are usually mild and transient and resolve within a few minutes to hours. Patches should be applied only to intact skin with no blisters. They can be used either alone or as part of adjunctive treat-
Another organization, the American Pain Society, has published standards of care related to pain assessment and management. The Agency for Healthcare Research and Quality (see http://www.aHRG.gov/whatsnew.asp#qt) and the World Health Organization (see http://www.who.int/en) have developed such standards. In addition, the Joint Commission (see http://www.joint commission.org) and the Agency for Healthcare Research and Quality (see http://www.aHRG.gov/whatsnew.asp#qt) have developed such standards. In addition, the World Health Organization (see http://www.who.int/en) has developed standards related specifically to cancer pain. Professional nursing organizations, including the Oncology Nursing Society and the American Nurses Association, have also created standards of care related to pain assessment and management. Another organization, the American Pain Society, has published new opioid guidelines available at http://www.jpain.org/article/ PII1526590008008316/fulltext.

**Assessment**

Adequate analgesia requires a holistic, comprehensive, and individualized patient assessment with specific attention to the type, intensity, and characteristics of the pain. Levels of comfort should also be assessed, with comfort defined as the extent of physical and psychologic ease that an individual experiences. A thorough health history, nursing assessment, and medication history should be obtained as soon as possible or upon the first encounter with the patient and should include questions about the following: (1) any allergies to nonopioids, opioids, partial or mixed agonists, and/or opioid antagonists (see previous pharmacologic discussion for examples of specific drugs); (2) any potential drug-drug and/or drug-food interactions; (3) presence of diseases or CNS depression; (4) any history of the use of alcohol, street drugs, or any illegal drug or substance and/or a history of substance abuse, with information about the substance, dose, and frequency of use; (5) the results of any laboratory tests ordered, such as levels of serum ALT, ALP, GGT, 5'-nucleotidase, and bilirubin (indicative of liver function), and/or levels of BUN and creatinine (reflective of renal function); abnormal liver or renal function may require that lower doses of the analgesic be used to prevent toxicity or overdosage; (6) the character and intensity of the pain, including onset, location, quality (stabbing/knifelike, throbbing, dull ache, sharp, diffuse, localized, or referred); actual rating of the pain using a pain assessment scale (see later); and any precipitating, aggravating, and/or relieving factors; (7) duration of the pain (acute vs. chronic); and (8) types of pharmacologic, nonpharmacologic, and/or adjunctive measures that have been implemented, with further explanation of the treatment’s duration of use and overall effectiveness.

The assessment should also look at factors or variables that may impact an individual’s pain experience, including physical factors (e.g., age, gender, pain threshold, overall state of health, disease processes or pathologies) as well as emotional, spiritual, and cultural variables (e.g., reaction to pain, pain tolerance, fear, anxiety, stressors, sleep patterns, societal influences, family roles, phase of growth and development, and religious, racial, and/or ethnic beliefs or practices). Age-appropriate assessment tools should be used to assess pain across the life span (see later discussion). For pediatric and elderly patients, nonverbal behavior or cues and information from family members or caregivers may be helpful in identifying pain levels. In an elderly individual, physical and cognitive impairments may affect reporting of pain; however, this does not mean that the elderly patient is not experiencing pain—the patient’s reporting may just be altered. Chronic pain and pain associated with cancer are both complex and multifactorial problems requiring a holistic approach with attention to other patient complaints, such as a decrease in activities of daily living, insomnia, depression, social withdrawal, anxiety, personality changes, and quality of life issues.

A system-focused nursing assessment should also be carried out, with further collection of both subjective and objective data relating to the patient’s neurologic status (e.g., level of orientation and alertness, level of sedation, sensory and motor abilities, reflexes), respiratory status (e.g., respiratory rate, rhythm, and depth; breath sounds), GI status (e.g., presence of bowel sounds; bowel patterns; complaints of constipation, diarrhea, nausea, vomiting, or abdominal discomfort), genitourinary status (e.g., urinary output; any burning or discomfort on urination; urinary retention), and cardiac status (e.g., pulse rate and rhythm, blood pressure, any problems with dizziness or syncope). Vital signs should be assessed and documented, including blood pressure,
**LIFE SPAN CONSIDERATIONS: The Pediatric Patient**

### Opioid Use

- Assessment of the pediatric patient is challenging, and all types of behavior that may indicate pain, such as muscular rigidity, restlessness, screaming, fear of movement, and withdrawn behavior, must be carefully considered.
- Adequacy of pain management is more difficult to determine in children because of their inability to express themselves. Frequently the reason older pediatric patients do not verbalize their pain is their fear of treatment, such as injections. Compassionate and therapeutic communication skills, as well as the use of alternate routes of administration, as ordered, will help in these situations.
- The “ouch scale” is often used to determine the level of pain in children. This scale is used to obtain the child's rating of the intensity of pain from 0 to 5 by means of simple face diagrams, from a very happy face for level 0 (no pain) to a sad, tearful face for level 5 (severe pain). Assessment of pain is very important in pediatric patients because they are often undermedicated. The nurse should always thoroughly assess the pediatric patient and not underestimate the child’s complaints and nonverbal behavior. Parents and caregivers play an important role in this assessment.
- The patient’s baseline age, weight, and height are important to document, because drug calculations are often based on these variables. With the pediatric patient, all mathematical calculations should be checked and double-checked for accuracy to avoid excessive dosages; this is especially true for opioids.
- Analgesics should always be given before pain becomes severe, and oral dosage forms should be used first, if appropriate.
- If suppositories are used, the nurse must be careful to administer the exact dose and not to split, halve, or divide an adult dose into a child’s dose. This may result in the administration of an unknown amount of medication and possible overdose.

- When subcutaneous, intramuscular, and intravenous medications are used, the principle of atraumatic care in the delivery of nursing care must be followed. One technique used to help ensure atraumatic care is the application of a mixture of local anesthetics or other prescribed substances to the injection site before the injection is given. EMLA (lidocaine/prilocaine) is a topical cream that anesthetizes the site of the injection; if ordered, it should be applied 1 to 2½ hours before the injection. Institutional policies and procedures should be consulted for further instructions regarding its use.
- Distraction and creative imagery may be used for older children such as toddlers or preschool-aged children.
- Pediatric patients should always be monitored very closely for any unusual behavior while receiving opioids.
- The following signs and symptoms of central nervous system changes should be reported to the prescriber immediately if they occur: dizziness, lightheadedness, drowsiness, hallucinations, changes in the level of consciousness, and sluggish pupil reaction. No further medication should be given until the nurse receives further orders from the prescriber.
- The nurse should always monitor and document vital signs before, during, and after the administration of opioid analgesics. Medication is usually withheld if respiration rate is less than 12 breaths/min or if there are any changes in the level of consciousness. Protocol should always be followed.
- Generally speaking, smaller doses of opioids, with very close and frequent monitoring, are indicated for the pediatric patient. Giving oral medications with meals or snacks may help to decrease gastrointestinal upset.

### Nonopioids

For patients receiving **nonopioid analgesics**, assessment should focus not only on general data as described earlier but also on the specific drug being given. For example, for patients taking acetaminophen, assessment should include determination of whether the patient has allergies, is pregnant, or is breast-feeding. There are no age-related precautions regarding acetaminophen use for children or the elderly; however, assessment should address contraindications, cautions, and drug interactions (see previous discussion). Once therapy has been initiated, there should be close monitoring for symptoms of chronic acetaminophen poisoning, as manifested by rapid, weak pulse, dyspnea, and cold and clammy extremities. Long-term daily use of acetaminophen may lead to increased risk of permanent liver damage, and thus the results of liver function studies should be monitored. Adults who ingest higher than recommended dosages may be at higher risk of liver dysfunction as well as other adverse effects such as loss of appe-
**EVIDENCE-BASED PRACTICE**

**Strategies of Pain Assessment Used by Nurses on Surgical Units**

**Review**

The purpose of this study was to identify various criteria that nurses use in the assessment of patients who are experiencing postoperative pain. In addition, the study looked at the kind of knowledge the nurses applied from their previous experiences in assessing these patients for pain.

**Type of Evidence**

Phenomenography, a qualitative research method, was used to analyze the data collected during interviews with 10 nurses as they performed pain assessments for 30 postsurgical patients. The study was carried out at a large urban New England hospital. It was anticipated that the number of years of nursing experience would be important in differentiating the types of criteria nurses used to assess pain. All patients had undergone surgery within the previous 24 hours and were experiencing pain. Patients were not using patient-controlled analgesia pump delivery systems and were not diagnosed with cancer. Patients did not have an altered level of consciousness. A series of five highly interactive, semistructured, audiotaped interviews were conducted with each nurse. Interviews focused on the nurse’s perception of the patient’s situation with consideration of how and on what basis the nurse judged the patient’s pain.

**Results of Study**

Data from 30 clinical pain assessments performed by the 10 nurses identified multiple criteria used in each nurse’s assessment of a patient. These same criteria were used as the framework from which the nurses developed and implemented variations in the assessment of pain. Nurses were found to draw on their past experiences in several ways when working with patients: they learned how to focus on listening to patients, what to look for, and what to do for patients in pain. Both objective and subjective criteria were used by the nurses to assess pain. Objective criteria focused on the patient’s appearance, whereas subjective criteria related more to what the patient said. This study was one of the first to empirically identify the criteria nurses use and the types of past knowledge they draw on when assessing patients for pain on a postoperative unit. Because it was a qualitative, descriptive study, the sample size was small; therefore, the strategies identified were by no means exhaustive or representative. Nevertheless, this study gave rise to true evidence-based practice, because the findings of this study prompted changes in pain assessment guidelines in this New England hospital, including adoption of a more subjective orientation and emphasis on the patient’s self-report as one of the single most reliable indicators of the presence and intensity of pain.

**Link of Evidence to Nursing Practice**

The results of this study led to major policy changes regarding the criteria used in assessing patients’ pain in a postoperative unit. However, questions that remain to be answered include the following: Does the strategy used for assessment influence the nurse’s perception of the intensity of pain and the need for pain management? Does the assessment strategy used have an influence on pain management decisions? Quantification of the use of different pain assessment strategies in a large sample of nurses will allow the findings of this particular study to be extended to identify the strategies actually used in contemporary nursing practice and the resulting pain management techniques implemented by nurses.

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**Opioids**

When opioid analgesics, or any other CNS depressants, are prescribed, assessment should focus on vital signs; allergies; respiratory disorders; respiratory function (rate, rhythm, depth, and breath sounds); presence of head injury (which will mask signs and symptoms of increasing intracranial pressure); neurologic status, with attention to level of consciousness or alertness and the level of sedation; sensory and motor functioning; GI tract functioning (bowel sounds and bowel patterns); and genitourinary functioning (intake and output). In addition, opioids, except morphine, may cause spasms of the sphincter of Oddi in the gallbladder and are not recommended for those with biliary disease because they may lead to pain. If renal and liver function studies are ordered, results should be monitored, because the risk of toxicity increases with diminished function of these organs. An additional concern is any past or present history of neurologic disorders such as Alzheimer’s disease, dementia, multiple sclerosis, muscular dystrophy, myasthenia gravis, or cerebrovascular accident or stroke, because the use of opioids may alter symptoms of the disease process, possibly masking symptoms or worsening the clinical presentation when no actual pathologic changes have occurred. In these situations, use of another analgesic or pain protocol may be indicated. Attention to age is also important, because both elderly and very young patients are more sensitive to opioids—as to many other medications. In fact, old or young age may be a contraindication to opioid use, depending on the specific drug. See the ear-

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tite, jaundice, nausea, and vomiting. Children are also at high risk of liver dysfunction if the recommended dosage ranges are exceeded. Use of the NSAIDs—such as ibuprofen, aspirin, and COX-2 inhibitors—requires assessment of renal and liver functioning as well as the gathering of information about GI disorders such as ulcers (see Chapter 44 for more information). With aspirin, age is important; this drug is not to be given to children and adolescent patients because of the risk of Reye’s syndrome. Aspirin may also lead to bleeding and ulcers, so ruling out conditions that represent contraindications and cautions to its use before therapy begins is important to patient safety. With tramadol hydrochloride, assessment of age is again very important, because this drug should not be used by individuals 75 years of age or older. A few miscellaneous nonopioid analgesics, including lidocaine transdermal and ziconotide, are newer options for managing different types of pain. For lidocaine transdermal patches, assessment should include information about the possible indications for this drug, for example, postherpetic neuralgia. When these patches are used, they must be kept away from children, and they should not be prescribed for very young, small, or debilitated patients, because such patients would be at higher risk for toxicity. Liver function should also be assessed. Ziconotide, given intrathecally, requires assessment for contraindications such as allergy to the drug, abnormal bleeding, infection at the site, and any problem involving the spinal fluid. See previous discussion for more information on contraindications, cautions, and drug interactions. Measurement of vital signs is also required.
lier pharmacology discussion regarding cautions, contraindications, and drug interactions.

**Opioid Agonists-Antagonists**

In patients taking **opioid agonists-antagonists**, such as buprenorphine hydrochloride, it is important to assess vital signs with attention to respiratory rate and breath sounds. The opioid agonists-antagonists still possess opioid agonist effects, and therefore the assessment information related to opioids is applicable to these drugs as well. It is also very important to remember during assessment that these drugs are still effective analgesics and still have CNS depressant effects but are subject to a ceiling effect (see earlier definition). Given the action of these drugs, the assessment should determine whether the patient is an abuser of opioids, because administering these agonists-antagonists with another opioid will lead to reversal of analgesia and possible opioid withdrawal. Age is another factor to assess, because these drugs are not recommended for use in patients 18 years or younger. See previous discussion for a listing of contraindications, cautions, and drug interactions.

**Opioid Antagonists**

The nurse must remember that the **opioid antagonists** are used mainly in reversing respiratory depression secondary to opioid overdosage. Naloxone may be used in patients of all ages, including neonates and children. Vital signs should be assessed and documented before, during, and after the use of the antagonist so that the therapeutic effects can be further assessed and documented and the need for further doses determined. In addition, the nurse must remember that the antagonist drug may not work with just one dosing and that repeated doses are generally needed to reverse the effects of the opioid. See the pharmacology section for information about contraindications, cautions, and drug interactions.

**Nursing Diagnoses**

- Acute pain related to specific disease processes or conditions and other pathologies leading to various levels and types of pain
- Chronic pain related to various disease processes, conditions, or syndromes causing pain
- Constipation related to the CNS depressant effects on the GI system
- Deficient knowledge related to lack of familiarity with opioids, their use, and their adverse effects
- Impaired gas exchange related to opioid-induced CNS effects and respiratory depression
- Risk for infection related to the adverse effect of urinary retention and subsequent urinary stasis from the use of opioids
- Risk for injury related to decreased sensorium or level of consciousness from use of either nonopioid or opioid analgesics
- Risk for injury related to possible overdosage and severe adverse reactions and/or drug interactions associated with the various classes of analgesics

**Planning**

**Goals**

- Patient states measures that will enhance the effectiveness of the analgesic regimen, such as taking medication as prescribed, using relaxation techniques, and practicing imagery.
- Patient identifies the rationale for use, therapeutic effects, and adverse effects associated with all types of analgesics.
- Patient states various measures to help minimize the occurrence of common adverse effects of nonopioids as well as opioids, such as forceful fluids (for constipation) and moving slowly and with assistance (to prevent injury).

**Outcome Criteria**

- Patient demonstrates increased comfort levels as seen by decreased use of analgesics, increased activity and performance of activities of daily living, decreased complaints of pain, and decreased levels of pain as rated on a scale of 1 to 10.
- Patient experiences minimal adverse effects and complications such as nausea, vomiting, and constipation associated with the use of analgesics, especially opioids.
- Patient uses nonpharmacologic measures such as relaxation therapy, distraction, and music therapy to help improve comfort and enhance any pharmacologic regimens.
- Patient manages adverse effects associated with analgesics, such as by using antiemetics, taking medication with meals, and implementing a bowel program.

**Implementation**

Once the cause of pain has been diagnosed or other assessment and data gathering have been completed, pain management should begin immediately and aggressively in conformity with the needs of each individual patient and each situation. Pain management is varied and multifaceted and should incorporate pharmacologic as well as nonpharmacologic approaches (see Box 11-1 and the Herbal Therapies and Dietary Supplements box). Pain management strategies should include consideration of the type of pain and pain rating as well as pain quality, duration, and precipitating factors, and interventions that help the pain. Some general principles of pain management are the following: (1) Individualize a plan of care based on the patient as a holistic and cultural being (see Cultural Implications box). (2) Manage mild pain with the use of nonopioid drugs such as acetaminophen, tramadol, and NSAIDs (see Chapter 44). (3) Manage moderate to severe pain with a stepped approach using opioids. Other analgesics or types of analgesics may be used in addition to other categories of medication (see pharmacology discussion). (4) Administer analgesics as ordered but before the pain gets out of control. (5) Always consider the use of nonpharmacologic comfort measures (see Box 11-1) such as homeopathic, folk, and herbal remedies; exercise; distraction; music or pet therapy; massage; and transcutaneous electrical stimulation. Although not always effective, these measures may prove beneficial for some patients. See Patient Teaching Tips for more information related to analgesics.

**Nonopioids**

**Nonopioid analgesics** should be given as ordered or as indicated for fever or pain. Acetaminophen should always be taken as prescribed and within the recommended dosage range over a 24-hour period because of the risk of liver damage and acute toxicity. If a patient is taking other OTC medications with acetaminophen, the patient should read the labels very carefully to identify the total amount of acetaminophen and any other drug interactions. Patient education about the signs and symptoms of acetaminophen overdose should emphasize the follow-
HERBAL THERAPIES AND DIETARY SUPPLEMENTS

**Feverfew (Chrysanthemum parthenium)**

- **Overview**
  A member of the marigold family known for its antiinflammatory properties
- **Common Uses**
  Treatment of migraine headaches, menstrual cramps, inflammation, fever
- **Adverse Effects**
  Nausea, vomiting, constipation, diarrhea, altered taste sensations, muscle stiffness, joint pain
- **Potential Drug Interactions**
  Possible increase in bleeding with the use of aspirin and other nonsteroidal antiinflammatory drugs, dipyridamole, and warfarin
- **Contraindications**
  Contraindicated in those allergic to ragweed, chrysanthemums, and marigolds, as well as those about to undergo surgery

ing: bleeding, loss of energy, fever, sore throat, and easy bruising (due to hepatotoxicity). These should be reported immediately to the nurse and/or prescriber. The nurse should also instruct the patient to report a worsening of pain or changes in the nature of the pain.

Suppository dosage forms of acetaminophen—like suppository forms of other drugs—should be placed into a medicine cup of ice. Once the suppository is unwrapped, cold water should be run over it to moisten the suppository for easier insertion. The suppository is inserted into the rectum using a gloved finger and water-soluble lubricating gel, if necessary. Acetaminophen tablets may be crushed if needed. Adult patients who take more than 2.6 g in 24 hours are at risk for mild liver damage; those taking 10 g or more (e.g., deliberate overdoses) are at high risk for severe liver damage; and death is possible after ingestion of more than 15 g. Liver damage from acetaminophen may be minimized by timely dosing with acetylcysteine (see previous discussion). The patient should be warned about the foul taste and odor of acetylcysteine. Many patients say this drug smells and tastes like rotten eggs. Acetylcysteine is better tolerated if it is disguised by mixing with a drink such as cola or flavored water to increase its palatability. Use of a straw may help minimize contact with the mucous membranes of the mouth and is recommended. This antidote may be given through a straw or other analgesic. Once the drug is administered, the nurse should assess the effectiveness of the drug and/or other interventions as the times of onset and peak effect of the drug and the route) to monitor during therapy. Decreased peristalsis may indicate the need for a dietary change, such as increased fiber, or use of a stool softener or mild laxative (see Box 11-2). Pupil reactions should be assessed. Pinpoint pupils indicate an overdose.

Opioids or any analgesic should be given before the pain reaches its peak to help maximize the effectiveness of the opioid or other analgesic. Once the drug is administered, the nurse should return at the appropriate time (taking into consideration the times of onset and peak effect of the drug and the route) to assess the effectiveness of the drug and/or other interventions as well as observe for the presence of any adverse effects (see previous discussion of pain assessment tools). With regard to the route of administration, the recommendation is that oral dosage forms be used first, but only if ordered and if there is no nausea or vomiting. The dose with food may help minimize GI upset. Should nausea or vomiting be problematic, an antiseptic may be ordered for administration before or with the dosing of medication. Crucial safety measures include keeping bed side rails up, turning bed alarms on (depending on the policies and procedures of the specific facility), and making sure the call bell is within the patient’s reach. These measures will help to prevent falls or injury related to opioid use. Opioids and similar drugs lead to CNS depression with possible confusion, altered sensorium or alertness, hypotension, and altered motor functioning. Because of these drug effects, all patients are at risk for falls or injury, and the elderly are at higher risk (see the Life Span Considerations box on p. 172 and Box 11-2). Refer to Box 11-4 for more specific information concerning the handling of controlled substances and narcotics counts.

When managing pain with morphine and similar drugs, the nurse should withhold the dose and contact the prescriber if there is any decline in the patient’s condition or if the vital signs are abnormal (see parameters mentioned earlier) and especially if the respiratory rate is less than 10 breaths/min. Intramuscular injections are rarely used because of the availability of other

**Opioids**

When opioids (and other analgesics) are prescribed, the nurse should administer the drug as ordered after checking for the “Six Rights” of medication administration (see Chapter 1). After the prescriber’s order has been double-checked, the medication profile and documentation should be examined to determine the last time the medication was given before another dose is administered. Patient’s vital signs should be monitored at frequent intervals with special attention to respiratory changes. A respiratory rate of 10 breaths/min (some protocols still adhere to the parameter of 12 breaths/min) may indicate respiratory depression and should be reported to the prescriber. The drug dosage, frequency, and/or route may need to be changed or an antidote (opioid antagonist) given if respiratory depression occurs. Naloxone should always be available, especially with the use of intravenous and/or other parenteral dosage forms of opioids, such as PCA (see Chapter 10 and the discussion to follow), and/or epidural infusions. Naloxone is indicated to reverse CNS depression, specifically respiratory depression, but one must remember that this antidote also reverses analgesia. The patient’s urinary output should also be monitored and should be at least 600 mL/24 hr. Bowel sounds should be monitored during therapy. Decreased peristalsis may indicate the need for a dietary change, such as increased fiber, or use of a stool softener or mild laxative (see Box 11-2). Pupil reactions should be assessed. Pinpoint pupils indicate an overdose.

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LIFE SPAN CONSIDERATIONS: The Elderly Patient

**Opioid Use**

- The nurse should document the patient’s weight and height before opioid therapy is begun. The patient should be monitored carefully for any changes in vital signs, level of consciousness, or respiratory rate, as well as any changes indicative of central nervous system depression, and any such changes should be documented.
- Many institutionalized or hospitalized elderly patients are very stoic about pain; elderly patients may also have altered presentations of common illnesses so that the pain experience manifests in a different way or may simply be unable to state how they feel in a clear manner. Each and every patient—regardless of age—has the right to a thorough pain assessment and adequate and appropriate pain management. It is a myth that aging increases one’s pain threshold. The problem is that cognitive impairment and dementia are often major barriers to pain assessment. Nevertheless, many elderly patients are still reliable in their reporting of pain, even with moderate to severe cognitive impairment.
- Over time, the elderly may lose reliability in recalling and accurately reporting chronic pain. The elderly, especially those 75 years of age or older, are at higher risk for too much or too little pain management, and the nurse must remember that drugs have a higher peak and longer duration of action in these patients than in their younger counterparts.
- Smaller dosages of opioids are generally indicated for elderly patients because of their increased sensitivity to the central nervous system depressants and diminished renal and hepatic function. Paradoxical (opposite) reactions and/or unexpected reactions may also be more likely to occur in patients of this age group.
- In elderly male patients, benign prostatic hypertrophy or obstructive urinary diseases should be considered because of the urinary retention associated with the use of opioids. Urinary outflow can become further diminished in these patients and result in adverse reactions or complications. Dosage adjustments may need to be made by the prescriber.
- Polypharmacy is often a problem in older adults; therefore it is important for the nurse to have a complete list of all medications the patient is currently taking and to assess for drug interactions and treatment (drug) duplication.
- Frequent reassessments of elderly patients are needed. The nurse should pay attention to level of consciousness, alertness, and cognitive ability while ensuring that the environment is safe by keeping a call bell or light at the bedside. Using bed alarms and/or raising side rails are indicated where appropriate.
- Decreased circulation causes variation in the absorption of intra-muscular or intravenous dosage forms and often results in the slower absorption of parenteral forms of opioids.
- As stated by the American Geriatric Society on the Management of Pain, nonsteroidal antiinflammatory drugs should be used with caution because of their potential for renal and gastrointestinal toxicity. Acetaminophen is the drug of choice for relieving mild to moderate pain, but with cautious dosing because of hepatic and renal concerns. The oral route of administration is preferred for analgesia. The regimen should be as simple as possible to enhance compliance, and the nurse should be sure to note, report, and document any unusual reactions to the opioid drugs. Hypotension and respiratory depression may occur more frequently in elderly patients taking opioids; thus very careful vital sign monitoring is needed.

effective and convenient dosage forms, such as PCA pumps, transdermal patches, continuous subcutaneous infusions, and epidural infusions.

For transdermal patches (e.g., transdermal fentanyl), two systems are used. The oldest type of patch contains a reservoir system consisting of four layers beginning with the adhesive layer and ending with the protective backing. Between these two layers are the permeable rate-controlling membrane and the reservoir layer, which holds the drug in a gel or liquid form. The newer type of patch has a matrix system consisting of two layers: one layer containing the active drug with the releasing and adhesive mechanisms, and the protective impermeable backing layer. The advantages of the matrix system over the reservoir system are that the patch is thinner and smaller, it is more comfortable, it is worn for up to 7 days (the older reservoir system patch is worn for up to 3 to 4 days), and it appears to result in more constant serum drug levels. In addition, the matrix system is alcohol free; the alcohol in the reservoir system often irritates the patient’s skin. It is important for the nurse to know what type of delivery system is being used so that proper guidelines are followed to enhance the system’s and drug’s effectiveness.

Transdermal patches should be applied to a clean, nonhairy area. When the patch is changed, as ordered, the new patch should be placed on a new site, but only after the old patch has been removed and the old site cleansed of any residual medication. Rotation of sites helps to decrease irritation and enhance drug effects. Transdermal systems are beneficial for the delivery of many types of medications, especially analgesics, and have the benefits of allowing multiday therapy with a single application, avoiding first-pass metabolism, improving patient compliance, and minimizing frequent dosing. However, the patient should be watched carefully for the development of any type of contact dermatitis caused by the patch (the prescriber should be contacted immediately if this occurs) and should maintain his or her own pain journal when at home. Journal entries are a valid source of information for the nurse, other health care professionals, the patient, and family members to assess the patient’s pain control and to monitor the effectiveness not only of transdermal analgesia but also any medication regimen.

With the intravenous administration of opioid agonists the nurse should always follow the manufacturer’s guidelines and institutional policies regarding specific dilutional amounts and solutions as well as the time period for infusion. When PCA is used, the amounts and times of dosing should be noted in the appropriate records and tracked by appropriate personnel. The fact that a pump is being used, however, does not mean that it is 100% reliable or safe. To be sure that all is functioning properly, the nurse should monitor pain levels, response to medication, and vital signs just as frequently as—if not more frequently than—with other parenteral opioid administration. The nurse should follow dosage ranges for all opioid agonists and agonists-antagonists and pay special attention to the dosages of morphine and morphine-like drugs. For intravenous infusions, the nurse is responsible for monitoring the intravenous needle site and infusion rates and documenting any adverse effects or complications. Another point for the nurse to remember when administering opioids—as well as any other anal-
BOX 11-4 Controlled Substance/Opioid Counts—A Must Do!

Any medication that has the potential for abuse or is a controlled substance—often opioids—is handled differently from other medications. Opioids are delivered to a nursing unit by the pharmacy, and these and other controlled substances are investigated by registered nurses. If any opioids are unaccounted for, the nurse manager or supervisor should be contacted immediately. The nurse should adhere to the following guidelines when giving opioids and other controlled substances: (1) Check the opioid administration record for the number left in stock. (2) Compare this number with the actual supply available. (3) If the count is accurate, obtain the desired dose of drug. (4) If the count is incorrect, notify the nurse manager or supervisor and follow any institutional policy. (5) Record the count of the remaining supply. Once the dose is removed, the nurse may be required to record the patient’s name, prescriber’s name, patient’s medical record number, dose of medication ordered, and the nurse’s signature. (6) Administer the drug according to policy and procedures. If the controlled substance cannot be given to the patient because of patient refusal, medication contraindication, changes in vital signs or status, or some other reason, the medication should be “wasted.” However, wasting of controlled substances usually requires the signature of another nurse who witnesses the discarding or wasting of the medication and documentation on the appropriate form. Automated systems record this information within the computer system.

Opioid Antagonists

Opioid antagonists should be given as ordered and should be readily available, especially when the patient is receiving PCA with an opioid, is opioid naive, or is receiving continuous doses of opioids. Several doses of these drugs are often required to ensure adequate opioid agonist reversal (see earlier discussion). Patients should report any nausea, vomiting, or palpitations.

The nurse should remain current on information of all forms of analgesics as well as protocols for pain management with focus on the specific drug(s) as well as differences in the treatment of mild to moderate pain, severe pain, and pain in special situations (e.g., cancer pain). The World Health Organization’s three-step analgesic ladder provides a standard for pain management in cancer patients and should be reviewed as needed.

Dosing of medications for pain management is very important to the treatment regimen. As noted earlier, once a thorough assessment has been performed, it is best to treat the patient’s pain before it becomes severe, which is the rationale for considering pain to be the fifth vital sign. When pain is present for more than 12 hours a day, analgesic doses should be individualized and are best administered around the clock rather than on an as-needed basis, but dosing should always be within the dosage guidelines for each drug used. Around-the-clock (or scheduled) dosing maintains steady-state levels of the medication and prevents drug troughs and escalation of pain. No given dosage of an analgesic will provide the same level of pain relief for every patient, and so titration upward or even downward should be carried out individually and should be implemented as long as the analgesic is needed. Aggressive titration may be necessary in difficult pain control cases and in cancer pain situations. Patients with severe pain, metastatic pain, or bone metastasis pain may need increasingly higher dosages of analgesic, so an opiate such as morphine should be titrated until the desired response is achieved or until adverse effects occur. A patient-rated pain level of less than 4 on a scale of 1 to 10 is considered to indicate effective pain relief.

If pain is not managed adequately by monotherapy, other drugs or adjuvants may need to be added to enhance analgesic efficacy. This includes the use of NSAIDs (for analgesic, antiinflammatory effects), acetaminophen (for analgesic effects), corticosteroids (for mood elevation and antiinflammatory, antiemetic, and appetite stimulation effects), anticonvulsants (for treatment of neuropathic pain), tricyclic antidepressants (for treatment of neuropathic pain and for their innate analgesic properties and opioid-potentiating effects), neuroleptics (for treatment of chronic pain syndromes), local anesthetics (for treatment of neuropathic pain), hydroxyzine (for mild antianxiety properties as well as sedating effects and antihistamine and mild antiemetic actions), or psychostimulants (for reduction of opioid-induced sedation when opioid dosage adjustment is not effective). See Table 11-9 for a listing of drugs that should not be used in patients experiencing cancer pain.

Dosage forms are also important, especially with chronic pain and cancer pain. Oral administration is always preferred but is not always tolerated by the patient and may not even be a viable option for pain control. If oral dosing is not appropriate, less in-
TABLE 11-8  Opioid Administration Guidelines

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Nursing Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>buprenorphine and butorphanol codeine</td>
<td>When giving IV, infuse over the recommended time (usually 3-5 min). Always assess respirations before, during and after use. Give IM as ordered. Give PO doses with food to minimize GI tract upset; ceiling effects occur with oral codeine resulting in no increase in analgesia with increased dosage.</td>
</tr>
<tr>
<td>fentanyl</td>
<td>Administer parenteral doses as ordered and as per manufacturer guidelines in regard to mg/min to prevent CNS depression and possible cardiac or respiratory arrest. Transdermal patches come in a variety of dosages. Fentanyl lollipops are also available. Be sure to remove residual amounts of the old patch prior to application of a new patch. Dispose of patches properly to avoid inadvertent contact with children or pets.</td>
</tr>
<tr>
<td>hydromorphone</td>
<td>May be given subcut, rectally, IV, PO, or IM.</td>
</tr>
<tr>
<td>levorphanol</td>
<td>May be given PO, subcut, or IV; give IV forms over 5 min or as indicated by manufacturer guidelines; longer acting, lasting up to 6-8 hr.</td>
</tr>
<tr>
<td>meperidine</td>
<td>Given by a variety of routes: IV, IM, or PO; highly protein bound, so watch for interactions and toxicity. Monitor elderly patients for increased sensitivity.</td>
</tr>
<tr>
<td>morphine</td>
<td>Available in a variety of forms: subcut, IM, PO, IV, extended and immediate release; morphine sulfate (Duramorph) for epidural infusion. Always monitor respiratory rate.</td>
</tr>
<tr>
<td>nalbuphine</td>
<td>IV doses of 10 mg given undiluted over 5 min.</td>
</tr>
<tr>
<td>naltrexone</td>
<td>Antagonist given for opioid overdose; 0.4 mg usually given IV over 15 sec or less. Reverses analgesia as well.</td>
</tr>
<tr>
<td>propoxyphene</td>
<td>PO dosing only; drug associated with high abuse potential.</td>
</tr>
<tr>
<td>oxycodone</td>
<td>Often mixed with acetaminophen or aspirin; PO and suppository dosage forms. Now available in both immediate and sustained-release tabs.</td>
</tr>
<tr>
<td>oxymorphone</td>
<td>Available in PO, IM, IV, subcut, and rectal suppository dosage forms.</td>
</tr>
<tr>
<td>pentazocine</td>
<td>Subcut, IV, and IM forms; mixed agonist-antagonist; IV dose of 5 mg to be given over 1 min.</td>
</tr>
</tbody>
</table>

CNS, Central nervous system; GI, gastrointestinal; IM, intramuscular(ly); IV, intravenous(ly); PO, oral(ly); subcut, subcutaneous(ly).

TABLE 11-9  Drugs Not Recommended for Treatment of Cancer Pain

<table>
<thead>
<tr>
<th>Class</th>
<th>Drug</th>
<th>Reason for Not Recommending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioids with dosing around the clock</td>
<td>meperidine</td>
<td>Short (2-3 hr) duration of analgesia; administration may lead to CNS toxicity (tremor, confusion, or seizures)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Cannabinoids</td>
<td>Adverse effects of dysphoria, drowsiness, hypotension, and bradycardia, which preclude their routine use as analgesics; may be indicated for use in treating severe chemotherapy-induced nausea and vomiting</td>
</tr>
<tr>
<td>Opioid agonists-antagonists</td>
<td>pentazocine</td>
<td>May precipitate withdrawal in opioid-dependent patients; analgesic ceiling effect; possible production of unpleasant psychologic adverse effects, including dysphoria, delusions, and hallucinations</td>
</tr>
<tr>
<td></td>
<td>butorphanol</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nalbuphine</td>
<td></td>
</tr>
<tr>
<td></td>
<td>buprenorphine</td>
<td></td>
</tr>
<tr>
<td>Opioid antagonists</td>
<td>naloxone</td>
<td>Analgesic ceiling effect; can precipitate withdrawal if given with an opioid</td>
</tr>
<tr>
<td></td>
<td>naltrexone</td>
<td>Reverses analgesia as well as CNS depressant effects, such as respiratory depression</td>
</tr>
<tr>
<td>Combination preparations</td>
<td>Brompton cocktails</td>
<td>No evidence of analgesic benefit over use of single opioid analgesic</td>
</tr>
<tr>
<td></td>
<td>DPT* (meperidine</td>
<td>Efficacy poor compared with that of other analgesics; associated with a higher incidence of adverse effects</td>
</tr>
<tr>
<td></td>
<td>promethazine, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>chlorpromazine)</td>
<td></td>
</tr>
<tr>
<td>Anxiolytics (as monotherapy) or sedatives-hypnotics (as monotherapy)</td>
<td>Benzodiazepines (e.g., alprazolam)</td>
<td>Analgesic properties not associated with these drugs except in some situations of neuropathic pain; common risk of sedation, which may put some patients at higher risk for neurologic complications</td>
</tr>
<tr>
<td></td>
<td>Barbiturates</td>
<td>Analgesic properties not demonstrated; sedation is problematic and limits use</td>
</tr>
<tr>
<td></td>
<td>Benzodiazepines</td>
<td></td>
</tr>
</tbody>
</table>

CNS, Central nervous system. *DPT is the abbreviation for the trade names Demerol, Phenergan, and Thorazine.

Invasive routes of administration include rectal and transdermal routes. Rectal dosage forms are safe, inexpensive, effective, and helpful if the patient is experiencing nausea or vomiting or altered mental status; however, this route would not be suitable for those with diarrhea, stomatitis, and/or low blood cell counts. Transdermal patches may provide up to 7 days of pain control but are not for rapid dose titration and are used only when stable analgesia has been previously achieved. Long-acting forms of morphine and fentanyl may be delivered via transdermal patches when a longer duration of action is needed. Intermittent injections or continuous infusions via the intravenous or subcutaneous route are often used for opioid delivery and may be administered at home in special pain situations, such as in hospice care or management of chronic cancer pain. Subcutaneous infusions are...
often used when there is no intravenous access. PCA pumps may be used to help deliver opioids intravenously, subcutaneously, or even intraspinally and can be managed in home health care or hospice care for the patient at home. Use of the intrathecal or epidural route requires special skill and expertise, and delivery of pain medications using these routes is available only from certain home health care agencies for at-home care. The main reason for long-term intraspinal opioid administration is intractable pain. Transnasal dosage forms are approved only for butorphanol, an agonist-antagonist drug, and this dosage form is generally not used or recommended. Regardless of the specific drug or dosage form used, a fast-acting rescue drug should always be ordered for patients with cancer pain and patients presenting other special challenges in pain management.

**Summary**

Regardless of the drug(s) used for the pain management regimen, the nurse must always remember that individualization of treatment is one of the most important considerations for effective and quality pain control. The nurse should also do or consider the following:

- At the initiation of pain therapy, conduct a review of all relevant histories, laboratory test values, and diagnostic study results in the patient’s medical record. If there are underlying problems, the nurse should be sure to consider them but should not forget to treat the patient. The nurse should not let these problems overshadow the fact that there is a patient who is in pain.
- Always develop goals for pain management in conjunction with the patient, family members, significant others, and/or caregiver. These goals should include improving the level of comfort with increased levels of activities of daily living and ambulation.
- Collaborate with other members of the health care team to select a regimen that will be easy for the patient to follow while in the hospital and, if necessary, at home (e.g., for cancer patients and other patients with chronic pain).
- Be aware that most regimens for acute pain management include treatment with short-acting opioids plus the addition of other medications such as NSAIDs.
- Be familiar with equianalgesic doses of opioids, because lack of knowledge may lead to inadequate analgesia or overdose.
- Use an analgesic appropriate for the situation (e.g., short-acting opioids for severe pain secondary to a myocardial infarction, surgery, or kidney stones). For cancer pain, the regimen usually begins with short-acting opioids with eventual conversion to sustained-release formulations.
- Use preventative measures to manage adverse effects. In addition, a switch is made to another opioid as soon as possible if the patient finds that the medication is not controlling the pain adequately.
- Consider the option of anagelsic adjuvants, especially in cases of chronic pain or cancer pain; these might include other prescribed drugs such as corticosteroids, antidepressants, anti-inflammatories, and muscle relaxants. OTC drugs and herbal may be helpful.
- Be alert to patients with special needs, such as patients with breakthrough pain. Generally, the drug used to manage such pain is a short-acting form of the longer-acting opioid being given (e.g., immediate-release morphine for breakthrough pain while sustained-release morphine is also used).
- Identify community resources that can assist the patient, family members, and/or significant others. These resources may include various web-based sites such as http://www.WebMD.com, http://www.pain.com, and http://www.mayoclinic.org. Many other pain management sites may be found on the Internet by searching using the terms pain or pain clinic.
- Because fall prevention is of utmost importance in patient care (after the ABCs of care are addressed), monitor the patient frequently after an analgesic is given. Frequent measurement of vital signs, inclusion of the patient in a frequent watch program, and/or use of bed alarms are encouraged.
- Restraints may cause many injuries; therefore, if restraints are necessary, follow the appropriate procedures, including specific institutional policies and rules. Assess, monitor, evaluate, and document the reason for the restraint; also document the patient’s behavior, the type of restraint used, and the assessment of the patient after the placement of restraints. Use of restraints has been largely replaced with a bed watch system.

**CASE STUDY**

**Opioid Administration**

You are assigned to care for a patient who is in the terminal phases of breast cancer. As a home health care nurse, you have many responsibilities; however, you have not cared for many patients who are in the terminal phase of their illness. In fact, most of your patients are postoperative and have only required assessments, dressing changes, and wound care.

Ms. D. is 48 years of age and underwent bilateral mastectomy 4 years ago. She had lymph node involvement at the time of surgery, and recently metastasis to the bone has been diagnosed. She has been taking oxycodone (one 5-mg tab every 6 hours) at home but is not sleeping through the night and is now complaining of increasing pain to the point that her quality of life has decreased significantly. She wants to stay at home during the terminal phases of her illness but needs to have adequate and safe pain control. Her husband of 18 years is very supportive. They have no children. They are both college graduates and have medical insurance.

1. Ms. D.’s recent increase in pain has been attributed to bone metastasis in the area of the lumbar spine. At this time the oxycodone is not beneficial, and you as the home health care nurse need to advocate for Ms. D. to receive adequate pain relief. When discussing her pain medications with her physician, what type of medication would you expect to be ordered to relieve the bone pain, and what is the rationale for this medication? (Provide references from within this chapter to support the selection of the specific opioid drug.)

2. Ms. D.’s husband confides in you that he is worried that she will become addicted to the new medication. He is not sure he agrees with around-the-clock dosing. How do you address his concerns?

3. What should Mr. D. do if he feels that Ms. D. has had an overdose?

For answers, see http://evolve.elsevier.com/Lilley.
and the use of bed and/or wheelchair alarms. Instructions should be given to the patient, family members, and/or caregivers about the risk for falls and the need for safety measures. Restraints are not used in long-term care facilities.

**Evaluation**

Positive therapeutic outcomes of acetaminophen use are decreased symptoms, fever, and pain. Adverse reactions for which the nurse should monitor include anemias and the previously mentioned liver problems due to hepatotoxicity. In addition, abdominal pain and vomiting should be reported to the prescriber. During and after the administration of other nonopioid analgesics such as tramadol, opioids, and mixed opioid agonists, the nurse should monitor the patient for both therapeutic effects and adverse effects. Therapeutic effects include increased comfort levels as well as decreased complaints of pain and longer periods of comfort, with improvements in performance of activities of daily living, appetite, and sense of wellbeing. Adverse effects vary with each drug (see earlier discussions) but often consist of nausea, vomiting, constipation, dizziness, headache, blurred vision, decreased urinary output, drowsiness, lethargy, sedation, palpitations, bradycardia, bradypnea, dyspnea, and hypotension. Should vital signs change, the patient’s condition decline, or pain continue, the prescriber should be contacted immediately and the patient closely monitored. Respiratory depression may be manifested by a respiratory rate of less than 10 breaths/min, dyspnea, diminished breath sounds, and/or shallow breathing. Evaluation should also include review of the effectiveness of multimodal and nonpharmacologic approaches to pain management.

**PATIENT TEACHING TIPS**

- Opioids should not be used with alcohol or with other CNS depressants, unless ordered, because of worsening of the depressant effects.
- A holistic approach to pain management may be appropriate, with the use of complementary modalities, including the following: biofeedback, imagery, relaxation, deep breathing, humor, pet therapy, music therapy, massage, use of hot or cold compresses, and use of herbal products.
- Dizziness, difficulty breathing, low blood pressure, excessive sleepiness (sedation), confusion, or loss of memory should be reported to the nurse, prescriber, or other health care providers.
- Opioids may result in constipation so forcing fluids (up to 3 L/day unless contraindicated), increasing fiber/bulk consumption, and exercising as tolerated is recommended. Stool softeners may also be necessary.
- Any nausea or vomiting should be reported. Antiemetic drugs may be prescribed.
- Any activities requiring mental clarity or alertness may need to be avoided if experiencing drowsiness or sedation. Ambulate with caution and/or assistance as needed.
- It is important for the patient to share any history of addiction with health care providers, but when such a patient experiences pain and is in need of opioid analgesia, the nurse must understand that the patient has a right to comfort. Any further issues with addiction may be managed during and after the use of opioids. Keeping an open mind regarding the use of resources, counseling, and other treatment options is important in dealing with addictive behaviors.
- If pain is problematic and not managed by monotherapy, then a combination of a variety of medications may be needed. Other drugs that may be used include antianxiety drugs, sedatives, hypnotics, or anticonvulsants.
- For the cancer patient or patient with special needs, the prescriber will monitor pain control and the need for other options for therapy or for dosing of drugs. For example, the use of transdermal patches, buccal tablets, and continuous infusions while the patient remains mobile or at home is often helpful in pain management. It is also important to understand that if morphine or morphine-like drugs are being used, the potential for addiction exists; however, in specific situations, the concern for quality of life and pain management is more important than the concern for addiction.
- Most hospitals have inpatient and outpatient resources such as pain clinics. The patient should seek these options and remain active in his or her care for as long as possible.
- Tolerance does occur with opioid use, so if the level of pain increases while the patient remains on the prescribed dosage, the patient should contact the prescriber or other health care provider for assistance. The patient should never change dosages of or double-up on medication of any type unless prescribed.

**POINTS TO REMEMBER**

- Pain is individual and involves sensations and emotions that are unpleasant. It is influenced by age, culture, race, spirituality, and all other aspects of the person.
- Pain is associated with actual or potential tissue damage and may be exacerbated or alleviated depending on the treatment and type of pain.
- Types of analgesics include the following:
  - Nonopioids, including acetaminophen, aspirin, and NSAIDs
  - Opioids, which are natural or synthetic drugs that either contain or are derived from morphine (opiates) or have opiate-like effects or activities (opioids), and opioid agonist-antagonist drugs.
- Pediatric dosages of morphine should be calculated very cautiously with close attention to the dose and kilograms of body weight. Cautious titration of dosage upward is usually the standard.
- Elderly patients may react differently than expected to analgesics, especially opioids and opioid agonists-antagonists.
- In treating the elderly, the nurse should remember that these patients experience pain the same as does the general population, but they may be reluctant to report pain and may metabolize opiates at a slower rate and thus are at increased risk for adverse effects such as sedation and respiratory depression. The best rule is to start with low dosages, reevaluate often, and go slowly during upward titration.
NCLEX EXAMINATION REVIEW QUESTIONS

1. For best results when treating severe pain associated with pathologic spinal fractures related to metastatic bone cancer, the nurse should remember that the best type of dosage schedule is to administer the pain medication
   a. as needed.
   b. around the clock.
   c. on schedule during waking hours only.
   d. around the clock, with additional doses as needed for breakthrough pain.

2. A patient is receiving an opioid via a PCA pump as part of his postoperative pain management program. During rounds, the nurse finds him unresponsive, with respirations of 8 breaths/min and blood pressure of 102/58 mm Hg. After stopping the opioid infusion, what should the nurse do next?
   a. Notify the charge nurse
   b. Administer oxygen
   c. Administer an opiate antagonist per standing orders
   d. Perform a thorough assessment, including mental status examination

3. A patient with bone pain caused by metastatic cancer will be receiving transdermal fentanyl patches. The patient asks the nurse what benefits these patches have. The nurse’s best response includes which of the following features?
   a. More analgesia for longer time periods
   b. Less constipation and minimal dry mouth
   c. Less drowsiness than with oral opioids
   d. Lower dependency potential and no major adverse effects

4. The nurse suspects that a patient is showing signs of respiratory depression. Which drug could be the cause of this complication?
   a. naloxone (Narcan)
   b. hydromorphone (Dilaudid)
   c. acetaminophen (Tylenol)
   d. ziconotide (Prialt)

5. Several patients have standard orders for acetaminophen as needed for pain. When the nurse reviews their histories and assessments, the nurse discovers that one of the patients has a contraindication to acetaminophen therapy. Which patient is the one who should receive an alternate medication?
   a. A patient who has a fever of 103.4° F (39.7° C)
   b. A patient admitted with a deep vein thrombosis
   c. A patient admitted with severe hepatitis
   d. A patient who had abdominal surgery 1 week earlier

6. The nurse is administering an intravenous dose of morphine sulfate to a 48-year-old postoperative patient. The dose ordered is 3 mg every 3 hours as needed for pain. The medication is supplied in vials of 4 mg/mL. How much will be drawn into the syringe for this dose?

CRITICAL THINKING ACTIVITIES: BEST ACTION

1. The nurse is about to administer 5 mg of morphine sulfate intravenously to a patient with severe postoperative pain, as ordered. What is the most important assessment data that should be gathered before and after administering this drug? Explain your answer.

2. A patient complains that the drugs he is receiving for severe pain are not really helping. What would be the nurse’s best response to this patient?

3. A young woman is brought by ambulance to the emergency department because she was found unconscious next to an empty bottle of acetaminophen. While the medical team assesses her, the nurse goes to question the family about the situation. What is the most important piece of information to know about this possible overdose?

For answers, see http://evolve.elsevier.com/Lilley.