Chapter 30

Pain Assessment and Management

LEARNING OUTCOMES

After studying this chapter, you will be able to:

1. Identify types and categories of pain according to duration, origin, location, etiology, and intensity.
2. Differentiate pain threshold from pain tolerance.
3. Describe pain transduction, transmission, perception, and modulation.
4. Discuss pain theory, nervous system plasticity, and their application to nursing care.
5. Outline subjective and objective data to collect and analyze when assessing pain.
6. Identify and use valid pain scales for verbal and nonverbal client populations.
7. List examples of nursing diagnoses for clients with pain.
8. State outcome criteria by which to evaluate a client's response to interventions for pain.
9. Identify barriers to effective pain management.
10. Discuss pharmacological and nonpharmacological interventions for pain.
11. Define tolerance, physical dependence, and addiction.
12. Identify rationales for using various analgesic delivery routes.

According to the principles of beneficence and nonmaleficence, nurses, as health care professionals, must provide comfort and pain relief for all clients, regardless of status, heritage, and type of health problem. In support of this, the International Association for the Study of Pain (IASP) issued a statement that pain relief is a fundamental human right (IASP, 2011). Being the first-line advocates for humane and quality care of their clients (Canadian Nurses Association [CNA], 2008), it is an essential responsibility of the nurse to ensure that their clients have the best pain relief possible.

Canada has a rich history in the interprofessional study and treatment of pain. Seminal work by Melzack and Wall (1965), in addition to their strong humanitarian commitment to caring for clients suffering from pain, paved the way for other exceptional Canadian researchers to understand pain mechanisms and their implications for effective pain management. **Pain** is known as an unpleasant, multidimensional, and subjective experience, and only the person experiencing pain can describe it (if he or she is verbal or able to communicate by other means). No two people experience pain the same way; the experience of pain and its related responses are unique to each client and are influenced by the person's context and past pain experiences. While the person's self-report is the most valid measure of pain, some people may be unable to communicate, depending on their developmental stage, the presence of a degenerative disease or temporary clinical conditions. When the self-report of pain cannot be obtained, the nurse should rely on other indicators to detect the presence of pain including the use of valid behavioural pain scales developed for specific populations and in a given context (Herr et al., 2006). Therefore, effective pain management requires skillful communication and assessment on the part of the nurse.

Despite great advancements in pain research over the past 5 decades, unrelieved acute pain remains a ubiquitous problem with numerous physiological, psychological, and economic consequences (Dahl et al., 2003; McGillion, Watt-Watson, LeFort, & Stevens, 2007). Significant numbers of hospitalized clients unnecessarily experience moderate to severe pain after surgery or interventional procedures, which can delay recovery and discharge from hospital (Morrison et al., 2003). One of the main consequences of underdetection and unrelieved acute pain is the development of chronic pain, which often results in the impairment of cognitive functioning, emotional distress, fatigue, and depression (Dunwoody, Krenzischek, Pasero, Rathmell, & Polomano, 2008). Major contributors to unrelieved pain are knowledge gaps and pain-related misbeliefs among health care professionals, clients, and families.

Despite advancements in the understanding of pain and its consequences among scientists, health care professional groups, and client advocacy organizations in Canada, pain management practices generally need improvement. Historically, many health care professionals have not asked clients about their pain, and major discrepancies have been noted between clients' pain experiences and health care professionals' pain assessments (McGillion, Watt-Watson, Kim, & Graham, 2004). The problem has been compounded by the fact that many clients expect to have pain while in hospital, do not admit to having pain, and are reluctant to ask for help. Recent efforts in client care

improvement, such as the *Best Practice Guidelines* launched by the Registered Nurses' Association of Ontario (RNAO) in 2004 paved the way for many improvements in pain detection and pain control for the clients inside and outside of the hospital (RNAO, 2007). In addition to these Canadian guidelines, a position statement from the American Society of Pain Management Nursing (ASPMN) was published (Herr et al., 2006) to provide nurses with clinical recommendations for the assessment of pain in nonverbal client populations.

A major priority for nurses is the development of in-depth knowledge about pain mechanisms, assessment, and pharmacological and nonpharmacological management strategies. The Canadian Pain Society (CPS) emphasizes that clients have a right to the best pain relief possible (Watt-Watson, Clark, Finley, & Watson, 1999) and that nurses should be familiar with the following principles:

1. Unrelieved acute pain complicates recovery.
2. Routine assessment that includes clients' self-reports and the use of behavioural pain scales for nonverbal clients is essential for effective pain management.
3. The best pain management strategies involve clients, families, and health care professionals, where the clients and families being encouraged to communicate the presence of pain and health care professionals are knowledgeable about pain relief options.

The Nature of Pain

Pain has been defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage" (IASP, 1979). In accordance with this definition, Pasero and McCaffery (2010) highlighted that pain is "whatever the experiencing person says it is, existing whenever he (or she) says it does." On the basis of this, the person's self-report of pain represents the most valid measure or "gold standard" for the presence of pain and it should be obtained, whenever possible. The latter definition helped to change practice by emphasizing that health care professionals must believe clients with respect to their report and must pay particular attention to the client's subjective experience of pain.

A major limitation of the original definition of pain by the IASP (1979) is that it denies the presence of pain in clients unable to self-report, such as infants and preverbal children, older adults with severe cognitive deficits, and clients with altered levels of consciousness. To overcome this limitation, experts have proposed an alternative definition of pain stating that behavioural changes caused by pain are valuable forms of self-report and should be considered as alternative indicators of the presence of pain (Anand & Craig, 1996). A recent report by the IASP (2011) has put forth a statement that "the inability to communicate verbally does not negate the possibility that an individual is experiencing pain and is in need of appropriate pain-relieving treatment." Therefore, pain assessment must be designed to conform to the communication capabilities of the client. When the person is not able to self-report, the nurse should select and use behavioural pain scales that have been shown to be valid for their client population.

The experience of pain is complex and multidimensional, with sensory–discriminative, motivational–affective, and cognitive–evaluative components (Melzack & Casey, 1966). The traditional nineteenth-century definition describes pain as an unpleasant feeling that is the opposite of enjoyment. This highlights that pain is a sensory experience, yet pain is different from other senses because it is inseparable from its *affective* and *cognitive* properties. The sensory component of pain is supported by the nerve pathways dedicated to delivering the pain signal to the brain and to determining its quality, magnitude, and location. Once the brain perceives the pain signal, other cortical structures detect the unpleasant effect of pain and determine whether it is a trigger for action, such as withdrawal, avoidance or aggression. This motivational–affective component of pain is directed by the limbic system and the reticular formation in the brain stem (Melzack & Casey, 1966). By activating these structures, pain can disrupt everyday tasks, demand attention, and can become overwhelming. The central control exerted by the cortex provides the cognitive–evaluative component of pain, which refers to the significance or meaning of the pain experience. The cultural background, personal beliefs,

anxiety, attention, and anticipation of pain can all modify its multidimensional properties. Structures in the frontal cortex are thought to be implicated in mediating between the cognitive and affective features of pain.

When treating a client with pain, the nurse must understand that pain is defined in terms of its sensory, affective, and cognitive determinants and that it cannot be ascribed to only one of them. The therapeutic implications of this definition of pain is choosing a pain management plan that treats pain as not only a sensory but a cognitive and affective experience; this means providing the client with holistic care that includes analgesia as well as nonpharmacological interventions, such as relaxation or anxiety management.

Origin of Pain

Pain can be classified by its inferred origin into two major types: (a) nociceptive pain and (b) neuropathic pain. Common pain syndromes of both types are briefly described in the Clinical Manifestations box. See also the Evidence-Informed Practice box about administering analgesia to people with pain and whether that interferes with the diagnosis of pain.

NOCICEPTIVE PAIN **Nociceptive pain** is the result of the normal physiological processing of harmful or potentially harmful noxious stimuli that are perceived as being painful (Pasero & McCaffery, 2010). This type of pain is a result of the stimulation of **nociceptors** (nerves that transmit noxious stimuli) that is often the case with tissue damage due to trauma or inflammation (Pasero, 2004). Further, nociceptive pain can be categorized according to its origin as somatic or visceral. **Somatic pain** originates in the skin, muscles, bone, or connective tissue. The sharp sensation of a paper cut or aching and throbbing of a sprained ankle are examples of somatic pain. **Visceral pain** results from the stimulation of pain receptors in the organs. Visceral pain tends to be diffuse and often feels like deep somatic pain, that is, burning, aching, or a feeling of pressure. Visceral pain is frequently caused by stretching of the tissues, ischemia, or muscle spasms. For example, an obstructed bowel or blocked coronary artery will result in visceral pain (Pasero & McCaffery, 2010).

NEUROPATHIC PAIN **Neuropathic pain** is the result of injury to the nerves or an abnormal processing of stimuli by the nervous system (Adler, Nico, VandeVord, & Skoff, 2009). The nerves may be abnormal because of illness (e.g., postherpetic neuralgia, diabetic peripheral neuropathy), injury (e.g., phantom limb pain, spinal cord injury pain), or undetermined reasons. Neuropathic pain that arises after surgery or another invasive procedure that resulted in nerve damage is called *iatrogenic*. Neuropathic pain is chronic in nature; it is characterized by ongoing pain with the sensation of burning, prickling, and often a concomitant sensory discrimination deficit

CLINICAL MANIFESTATIONS OF COMMON PAIN SYNDROMES

The following are some common pain syndromes:

- *Postherpetic neuralgia.* An episode of herpes zoster (shingles) has two phases: (a) a vesicular eruption and (b) neurological pain that often encircles the body. The pain ranges from mild to severe. In postherpetic syndrome, severe pain persists for months or years with burning or electric-shock pain in the area of the original eruption. The main risk factors for the development of postherpetic neuralgia in individuals with herpes zoster are old age, the acuity of the initial pain, and the severity of the rash at the onset of shingles (Dworkin et al., 2008).
- *Phantom pain.* Phantom sensation, the feeling that a lost body part is present, occurs in most people after amputation. For many, this sensation is painful; it may occur spontaneously or be evoked (e.g., by using a poorly fitting prosthesis). When the amputation involves a limb, it is termed *phantom limb pain,* whereas following breast removal, it is called *postmastectomy pain*. Phantom pain varies and may be burning, severe, crushing, or a cramping sensation. This pain is neuropathic in nature and is complex because of the loss of sensory input into the central nervous system (CNS) from the amputated region (Melzack Katz, & Vaccarino, 2001; Saarto & Wiffen, 2010; Wolff et al., 2011).
- *Trigeminal neuralgia.* Trigeminal neuralgia is episodic; it is an intense stabbing pain that is distributed by one or more branches of the trigeminal (fifth cranial) nerve. The pain is usually experienced in small parts of the face and head, for example, gums, cheek, and surface of the head. The attacks of pain are often precipitated by sensory stimulation of the areas innervated by the trigeminal nerve, called "trigger zones" (Love & Coakham, 2001).
- *Headaches and migraines.* Headache is a common somatic pain that can be caused by either intracranial or extracranial problems. Although often similar to a regular headache, migraines are thought to be a neurovascular disorder characterized by severe throbbing headaches that are normally (but not always) unilateral. Attacks of migraines may be accompanied by nausea, vomiting, and photophobia (Schurks, Rist, Bigal, Buring, Lipton, & Kurth, 2009). Up to 20% of clients also present with an aura that is associated with the presence of neurological manifestations (Russell & Olesen, 1996). In addition to appropriate medication (e.g. administration of nonspecific treatments, such as Aspirin and acetaminophen, or migraine-specific drugs, such as ergotamine), both headaches and migraines can be treated by nonpharmacological approaches (e.g., avoidance of the triggers, education, and proper diet) and pharmacological approaches (Goadsby, Lipton, & Ferrari, 2002).
- *Fibromyalgia.* Fibromyalgia is a chronic disorder that is characterized by widespread musculoskeletal pain, fatigue, and multiple tender points. A *tender point* is tenderness that occurs in a precise, localized area, particularly in the neck, spine, shoulders, and hips. People with this syndrome can also experience sleep disturbances, morning stiffness, irritable bowel syndrome, anxiety, and other symptoms. Although the symptoms present as muscle pain, stiffness, and weakness, it is considered by many to be a problem of abnormal CNS functioning, particularly as it relates to the way nerves process pain (Mease, 2005).

EVIDENCE-INFORMED PRACTICE

Does Administering Analgesia to People with Acute Pain Interfere with the Diagnosis of the Pain?

Although some clinicians think that administering analgesia to people with acute pain, such as acute abdominal pain (AAP), might "mask" the pain and interfere with diagnosis, others think that it is unethical to leave a person in acute pain and that giving analgesia might actually help in making a diagnosis, especially if a physical examination can be performed with increased ease. To establish any conclusion on this matter, Manterola et al. (2011) conducted a systematic review of all published randomized control trials (RCTs) that compared the outcomes of opioid treatment versus no treatment of adults with AAP. The review concluded that "in addition to improving their comfort while the diagnostic process is concluded, (the use of opioids) does not increase the risk of diagnosis error or the risk of error in decisions for treatment."

NURSING IMPLICATIONS: Acute abdominal pain is a relatively common clinical situation. While the pain itself can be distressing to the client, not knowing the reason for the pain can be equally distressing. Nurses who work in clinical settings where analgesia is viewed as "masking" symptoms and interfering with diagnosis can be placed in a challenging situation as they try to help their clients deal with both the untreated pain and uncertainty about diagnosis. Using the knowledge derived from this meta-analysis will mean greater comfort for our clients with the assurance that having the pain managed will not interfere with diagnostic accuracy—a win-win situation for both nurses and their clients.

Source: Based on Manterola, C., Vial, M., Moraga, J., & Astudillo, P. (2011). Analgesia in patients with acute abdominal pain. *Cochrane Database of Systematic Reviews*, Issue 1. Art. No.: CD005660. DOI: 10.1002/14651858.CD005660.pub3

BOX 30.1 CONCEPTS ASSOCIATED WITH PAIN

The following are terms used in the study of pain and pain management:

- *Acute pain:* Pain that is directly related to tissue injury and resolves when tissue heals; it should not last for more than 6 months
- *Chronic pain:* Pain that persists beyond 6 months secondary to chronic disorders or nerve malfunctions that produce ongoing pain after healing is complete
- *Cancer pain:* Pain associated with the disease, treatment, or some other factor in individuals with cancer
- *Nociceptive pain:* Pain that is directly related to tissue damage and nociception; may be somatic (e.g., damage to skin, muscle, bone) or visceral (e.g., damage to organs)
- *Neuropathic pain:* Pain that is related to damaged or malfunctioning nervous tissue in the peripheral nervous system (PNS) or the CNS
- *Pain threshold:* The lowest intensity of noxious stimulation that reliably invokes pain
- *Pain tolerance:* The most pain an individual is willing or able to endure before taking evasive actions
- *Phantom pain:* Painful sensations felt from a part of the body that has been amputated; can arise from the residual limb (e.g., stump pain) or nerves that lost communication with the missing part

The following states indicate abnormal nerve functioning, and the associated cause needs to be identified or treated (as possible) before irreversible damage occurs:

- *Allodynia:* Sensation of pain from a stimulus that normally does not produce pain (e.g., light touch)
- *Dysesthesia:* An unpleasant, abnormal sensation that can be either spontaneous or evoked
- *Hyperalgesia:* Increased sensation of pain in response to a normally painful stimulus

in the affected area. The most common presentations of this condition are **hyperalgesia** and **allodynia** (Box 30.1) (Campbell & Meyer, 2006). It is thought that the phenomenon of neuroplasticity is a contributing factor to some of the abnormal changes that take place in many types of neuropathic pain (Pasero & McCaffery, 2010). **Neuroplasticity** is the ability of the brain to reorganize its signalling and the processing of stimuli in accordance with the input from the environment. These changes take place on a cellular level, but they have the ability to rearrange the functionality of larger CNS regions (Coderre, Katz, Vaccarino, & Melzack, 1993). Peripheral painful stimuli may sensitize neural structures involved in pain perception. For example, a prolonged noxious stimulus can result in changes to the sensitivity of the dorsal horn neurons that can be maintained even after the stimulus is removed (Melzack, Coderre, Katz, & Vaccarino, 2001). Smaller noxious stimuli to the same area may result in a higher amount of pain as well as a further increase in dorsal horn neuron sensitivity (**hyperexcitability**), thus initiating a vicious cycle of maintained pain. Continued noxious stimulation can also increase the receptive field of dorsal horn neurons. If not eliminated, it may produce prolonged excitability that is maintained without further stimulation (Coderre et al., 1993; Melzack et al., 2001). Neuropathic pain conditions tend to be difficult to treat. Unfortunately, evidence suggests that in some instances, neuropathic pain results from a failure to effectively treat acute pain episodes, such as that during the perioperative period (Manias, Bucknall, & Botti, 2005).

Neuropathic pain can be classified into two subcategories based on the assumed mechanism that is responsible for the pain: (a) peripheral neuropathic pain and (b) central neuropathic pain.

Peripheral neuropathic pain (e.g., phantom limb pain, postherpetic neuralgia, carpal tunnel syndrome) follows damage, sensitization, or abnormal changes of peripheral nerve fibres (Pasero & McCaffery, 2010). Peripheral neuropathic pain is typically chronic; it is

described as burning, an electric shock, or tingling, dull, and aching; episodes of sharp, shooting pain can also be experienced (Adler et al., 2009; Herr, 2002)

Central neuropathic pain (e.g., spinal cord injury pain, poststroke pain, multiple sclerosis pain) results from malfunctioning nerves in the CNS (brain and spinal cord). The neurons in the CNS may exhibit abnormal hyperexcitability as a result of complex changes induced by the ongoing firing of afferent nociceptors. These changes can occur anywhere in the CNS. One of the well-characterized central neuropathic pain mechanisms is the increased release and binding of the excitatory neurotransmitters in the milieu of the central neurons that are responsible for pain processing. Another mechanism, termed **central disinhibition,** causes hyperexcitability of the central pain neurons because of the loss of control mechanisms that usually inhibit the conduction of a pain signal (Pasero & McCaffery, 2010).

Complex regional pain syndrome (CRPS) is a term used for a number of pain conditions whose etiology is poorly understood (Dunwoody et al., 2008; Harden, Bruehl, Stanton-Hicks, & Wilson, 2007). The causative mechanisms of this group of pain conditions may include both PNS and CNS abnormalities. To be diagnosed with this condition, clients must have continuous moderate to severe pain along with edema and vasomotor, motor, or sensory changes in the affected area. In addition, all other diagnoses that explain the symptoms must be excluded (Harden et al., 2007). Pain in clients suffering from CRPS proves a difficult target to treat completely, and it usually requires multimodal pharmacological and holistic approaches (Gibbs, Drummond, Finch, & Phillips, 2008).

Duration of Pain

When pain lasts only through the expected recovery period (usually 30 days), it is described as **acute pain**. Acute pain is purposeful, informing the person that something is wrong. Typically, the onset of acute pain is sudden because of a noxious stimulus, such as trauma, and the location of the pain can usually be easily identified. This type of pain should not exceed 6 months, and if not adequately treated can become chronic (Joshi & Ogunnaike, 2005; Kehlet, Jensen, & Woolf, 2006).

Chronic pain lasts beyond 6 months (Bonica, 1990; Merskey & Bogduk, 1994) and has no purpose. Chronic pain can be further classified as chronic cancer pain or noncancer pain. Because its onset can be subtle, it may be difficult for the client to determine when the chronic pain started. It can also often be difficult to pinpoint the location of chronic pain, as it is typically more diffuse compared with acute pain. Chronic pain is complex and can become all-consuming, causing irritability, insomnia, and withdrawal from family, friends, and interests (Watt-Watson, Evans, & Watson, 1988).

Table 30.1 outlines some common differences between acute and chronic pain.

See the Reflect on Primary Health Care box on intersectoral collaborations in the assessment, treatment, and follow-up of a person with pain.

TABLE 30.1 Comparison of Acute and Chronic Pain

Acute Pain	Chronic Pain
Usually sudden onset	Onset may be sudden or gradual
Duration usually transient (never more than six months)	Duration prolonged (months to years)
Mild to severe	Mild to severe
Sympathetic nervous system responses: • Increased pulse rate • Increased respiratory rate • Elevated blood pressure • Diaphoresis • Dilated pupils • Purposeful warning or related to tissue injury; resolves with healing • Client commonly exhibits behaviour indicative of pain: crying, rubbing area, holding area • Client may appear restless and anxious	Parasympathetic nervous system responses: • Vital signs normal (because of adaptation) • Dry, warm skin • Pupils normal or dilated • No purpose; continues beyond healing • Client may appear depressed and withdrawn • Behaviour indicative of obvious pain often absent

REFLECT ON PRIMARY HEALTH CARE

Intersectoral collaboration is essential in the assessment, treatment, and follow-up of a person experiencing pain. Find out whether any pain clinics or networks are available in your region. In pain clinics, professionals, such as physicians, nurses, social workers, physiotherapists, psychologists, pharmacologists, and chaplains, work together to treat the client dealing with chronic pain.

Concepts Associated with Pain

Two additional terms used in the context of pain are *pain threshold* and *pain tolerance*. **Pain threshold** is the minimum level of noxious stimulation that reliably evokes pain (Cleeland, Serlin, Nakamura, & Mendoza, 1997). A person's pain threshold is generally fairly uniform, relative to the location of the pain and the kind of noxious stimulus experienced. The pain thresholds of two different individuals may be starkly different (Mader, Blank, Smithline, & Wolfe, 2003). Therefore, the same stimulus can cause various levels of pain in different individuals. The understanding of the pain threshold variability should remind a nurse to always elicit a client's report of his or her pain level to detect pain and provide adequate analgesia (Pasero & McCaffery, 2010). **Pain tolerance** is the maximum amount of painful stimuli that a person is willing or able to endure without seeking avoidance of the pain or relief. Pain tolerance can vary widely within individuals and cultures, as it relates to the cognitive–affective and subjective experience by each individual. For example, a woman may withstand severe pain for a prolonged period during childbirth to make the experience more natural or drug-free; however, she may want pain relief for a regular headache.

See Box 30.1 for a summary of concepts associated with pain. Some of these terms will be expanded on later in the chapter. See the Clinical Alert box about major contributors to unrelieved pain.

CLINICAL ALERT

Unrelieved acute pain should not be tolerated; it has numerous physiological, psychological, and economic consequences. Major contributors to unrelieved pain are client, health care professional, and societal knowledge gaps and misbeliefs about pain.

Physiology of Pain: Nociception

Nociception represents the neural and cortical activity that is necessary, but not sufficient, for pain. Pain is the conscious experience that emerges from nociception (Charlton, 2005). Four processes are involved in nociception: (a) transduction, (b) transmission, (c) perception, and (d) modulation (Pasero & McCaffery, 2010). The process of pain transduction and transmission involves three types of neurons: (a) the afferent or sensory neurons, (b) the efferent or motor neurons, and (c) the interneurons or connector neurons.

Transduction

The peripheral nervous system includes primary afferent sensory neurons specialized to detect noxious, or injurious, stimuli, which can be thermal, chemical, or mechanical in nature (see Table 30.2). The nerve fibres that transmit noxious information are called primary afferent nociceptors. Nociceptors are located throughout skin and mucosa and less frequently in deep structures, such as joints, arteries, and viscera; their terminals possess a broad array of very selective molecular receptors. When a sufficiently noxious stimulus is in the peripheral microenvironment (e.g., injury to cells or tissue), the nociceptors can be activated by the direct stimulus (e.g.,

TABLE 30.2 Types of Noxious Stimuli

Stimulus Type	Physiological Causes of Pain
Mechanical	
1. Trauma to body tissues (e.g., surgery)	Tissue damage; direct irritation of the pain receptors; inflammation
2. Alterations in body tissues (e.g., edema)	Pressure on pain receptors
3. Blockage of a body duct	Distension of the lumen of the duct
4. Tumour growth	Pressure on pain receptors; irritation of nerve endings
5. Muscle spasm	Stimulation of pain receptors (also see chemical stimuli)
Thermal	
Extreme heat or cold (e.g., burns, frostbite)	Tissue destruction; stimulation of thermosensitive pain receptors
Chemical	
1. Tissue ischemia (e.g., blocked coronary artery)	Stimulation of pain receptors because of accumulated lactic acid (and other chemicals, such as bradykinin and enzymes) in tissues
2. Muscle spasm	
3. Toxins	Tissue ischemia secondary to mechanical stimulation (see above)

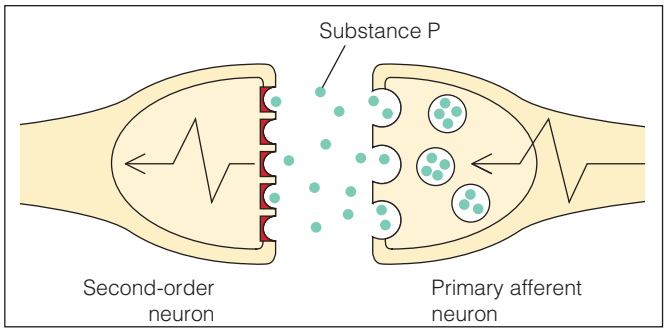

FIGURE 30.1 Substance P assists the transmission of impulses across the synapse from the primary afferent neuron to a second-order neuron.

heat, cold, or pressure) or by the biochemical mediators released from the milieu (local tissues, immune cells, and nerve endings) via their receptors (Caterina, Gold, & Meyer, 2005). The mediators that activate and further sensitize the nociceptors include serotonin, histamine, potassium, bradykinin, prostaglandins, and substance P (Marchand, 2008) (Figure 30.1). **Transduction** occurs when the excited nociceptor converts the surrounding noxious stimuli into an action potential (i.e., electrochemical impulse) that is then transmitted to the spinal cord to ultimately reach the CNS.

Transmission

Transmission occurs when noxious information is conducted through the spinal cord to the brain via two types of peripheral afferent nociceptive fibres: (a) A-delta fibres and (b) C fibres. A-delta fibres have a relatively large diameter, are myelinated, and rapidly conduct the impulse. These fibres are associated with the sensation of sharp, pricking pain. The other set of nociceptive fibres is the small-diameter, unmyelinated C fibres. C fibres transmit the impulse more slowly and mediate long-lasting, burning pain.

The terminals of afferent nociceptors enter the dorsal horn of the spinal cord through the dorsal root and synapse onto second-order neurons in substantia gelatinosa (Figure 30.2). Impulse transmission from the sensory (afferent) nerve fibres to the second-order neurons in the dorsal horn happens via the release of neurotransmitters, such as acetylcholine, norepinephrine, epinephrine, serotonin, and dopamine. The fast A-delta fibres primarily conduct impulses from mechanical and thermal pain. They synapse with second-order neurons (long fibres) in the dorsal horn that cross immediately to the opposite side of the spinal cord. They later enter the lateral spinothalamic tract and ascend to the brain, where the information about the pain stimulus

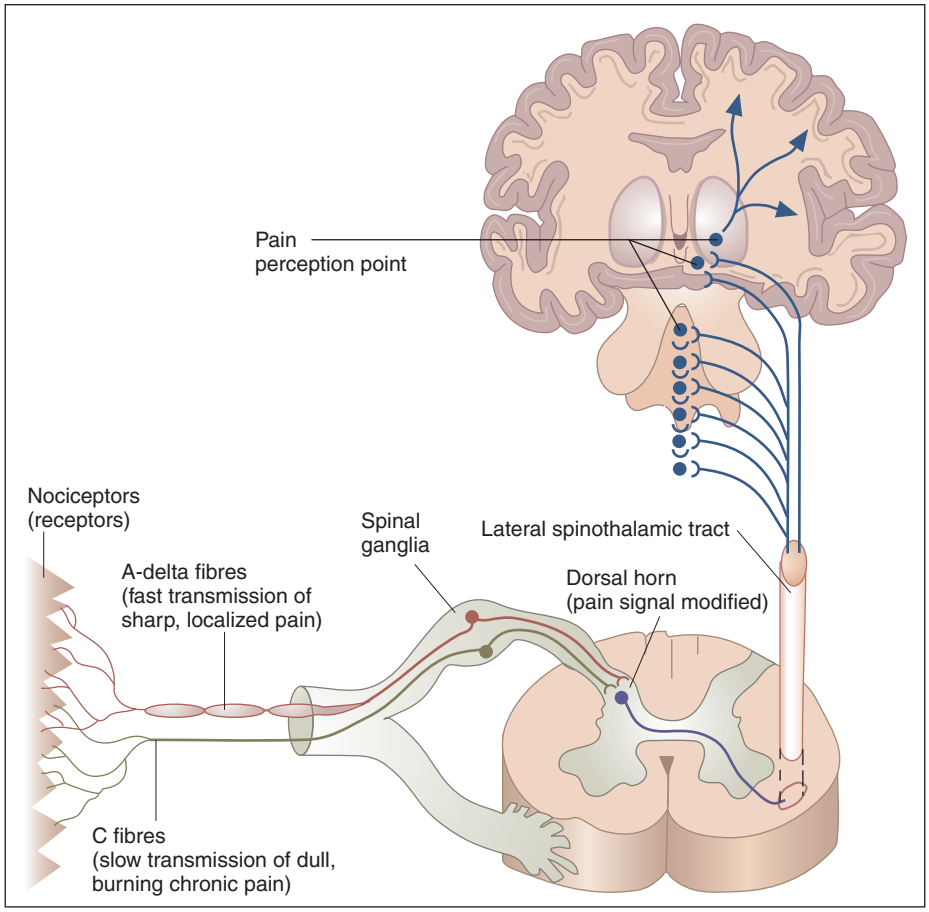

FIGURE 30.2 Nociception mechanisms.

is perceived and processed. A few fibres terminate in the reticular areas of the brain stem, but most nerve fibres of the spinothalamic tract terminate in the thalamus. From there, signals are sent to the basal areas of the brain and to the somatic sensory cortex. A-delta fibres allow for the detection of "first pain"—this is a mechanism of quick detection and localization of pain that would allow for a fast protective response, such as a withdrawal reflex (Dahl & Moiniche, 2004; Manias et al., 2005; Marchand, 2008).

The slow C fibres conduct impulses from mechanical, thermal, and chemical stimuli. C-fibre pain, or the "second" pain, is an aching pain that is poorly localized (Dahl & Moiniche, 2004; Marchand, 2008). The impulses from C fibres often pass through one or more additional short neurons in the dorsal horn before travelling up to the brain via the spinothalamic tract.

Perception

Perception occurs when a client becomes conscious of the pain. Four key regions of the cerebral cortex are thought to be activated by noxious stimuli via the ascending pathways: (a) the insular cortex, (b) the anterior cingulate cortex, (c) the primary somatosensory cortex, and (d) the secondary somatosensory cortex (Craig & Sorkin, 2011). These regions, together with other areas of the forebrain, produce the sensory–discriminative, motivational–affective, and cognitive–evaluative aspects of the pain experience, as well as motoric integration of noxious stimuli and pain memory (Basbaum & Bushnell, 2002; Basbaum & Jessell, 2000; Craig & Sorkin, 2011).

Modulation

Modulation is a process by which painful messages that travel from the noxious receptors to the CNS may be enhanced or inhibited. Modulation happens at every level of the pain pathway and includes the structures of the spinal cord, the brain stem, and the cortex. Pain can be modulated by ascending and descending mechanisms. A typical example of ascending pain modulation is rubbing an injury site, thus activating large non-nociceptive nerve fibres in the periphery. Stimulation of these large A-beta fibres activates inhibitory interneurons in the dorsal horn of the spinal cord, effectively preventing noxious signal transmission from the periphery to the higher brain regions. The physiological basis of this mechanism of pain modulation was elucidated by Melzack and Wall (1965) in their work on gate control theory (GCT), which is described later in the chapter.

Analgesia may also be produced at the level of the spinal cord and the brain stem (spinothalamic pathway) via the release of endogenous opioids and neurotransmitters. Endogenous opioids are naturally occurring morphine-like pentapeptides found throughout the nervous system. They exist in three general classes: (a) enkephalins, (b) dynorphins, and (c) beta-endorphins. These substances block neuronal activity related to noxious impulses by binding to opiate receptor sites in the central and peripheral nervous systems (Melzack & Wall, 1996). The opiate-binding receptor sites are identified as mu (μ), kappa (κ), and delta (δ) and are the same sites to which exogenous opioid analgesics (e.g., oxycodone) bind to provide pain relief. In the ascending pain modulation mechanism, endogenous opioids may be produced in the brain stem and the dorsal horn or exogenous opioids may be introduced by an administration of an opioid analgesic. The released or introduced opioids bind to the μ-opioid receptors on nociceptive nerve fibres, blocking the release of substance P. In the descending mechanism, the efferent spinothalamic nerve fibres that descend from the brain can inhibit the propagation of the pain signal by triggering the release of endogenous opioids in the brain stem and in the spinal cord. Serotonin and norepinephrine are two other important nonopioid pain-inhibitory neurotransmitters that act in the CNS. These substances are released by the descending fibres of the descending spinothalamic pathway (Jung, Staiger, & Sullivan, 1997; Marks et al., 2009; Saarto & Wiffen, 2010).

Endogenous pain control by higher cortical structures accounts for many differences in pain perception and interpretation. For example, many clients report lesser pain intensity when they are distracted or when they use imagery techniques to control their pain (Lorenz, Minoshima, & Casey, 2003). We have incomplete understanding of the mechanisms of cortical pain modulation, but it is thought to involve multiple levels of the CNS. One such pathway is the opioid-sensitive descending pathway from the prefrontal cortex to the amygdala, the rostral ventral medulla and the periaqueductal grey matter (Villemure & Bushnell, 2002). Other affective–motivation structures involved in the modulation of pain perception are located in the thalamus.

Gate Control Theory

In 1965, Melzack and Wall's gate control theory (GCT) (Melzack, 1990; Melzack & Wall, 1965, 1973, 1982) proposed that interneurons of the substantia gelatinosa act as a gate, regulating the input of large and small nerve fibres to lamina V cells (Figure 30.3).

According to GCT, pain is not a simple sensory experience but one that involves central perception and cognitive–appraisal mechanisms. This theory suggests that if small nociceptive fibre activity in the dorsal horn reaches a critical threshold without being blocked, nociceptive impulses are transmitted to the thalamus and cerebral cortex (Melzack & Wall, 1965, 1973, 1982). Pain perception can be modulated centrally through descending mechanisms that can be influenced by peoples' past

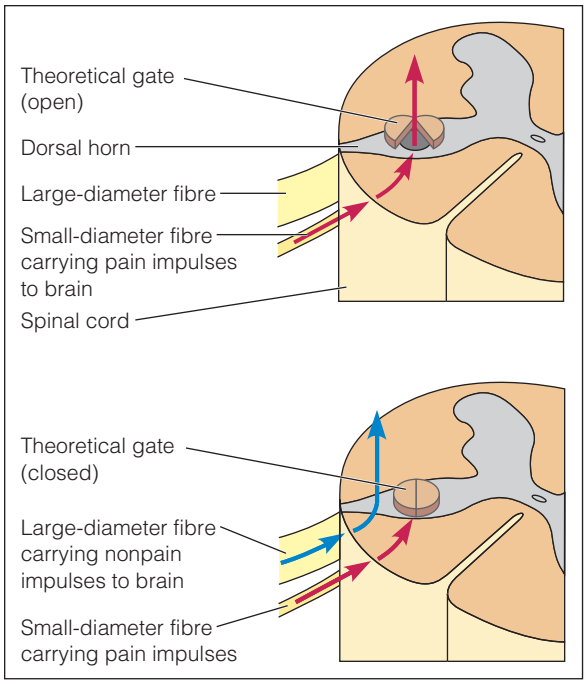

FIGURE 30.3 A schematic illustration of gate control theory.

experience, attention, and emotion. The modulation of the nociceptive signal happens via a "gating mechanism" in the substantia gelatinosa within the dorsal horn (Melzack & Wall, 1965, 1973, 1982).

This gating mechanism can be open, partially open, or closed. The position of the gate is influenced by the relative amounts of activity in large non-nociceptive (A-beta) and small nociceptive (A-delta and C) fibres. Increased activity in the large fibres closes the gate and inhibits the transmission of noxious messages carried by the small fibres to transmission cells (T cells) in the substantia gelatinosa (Melzack & Wall, 1965, 1973, 1982). However, if noxious impulses are not blocked by large fibre activity (i.e., the gate is open or partially open) and reach a critical level, they will be transmitted to second-order neurons in the substantia gelatinosa. The noxious impulse is then transmitted to the thalamus and the cerebral cortex, via ascending nociceptive second-order neurons.

Since GCT was developed, pain knowledge has greatly evolved. Cumulative research has led to more advanced understanding of the nature of pain and its mechanisms, including sensitization, cortical processing, and spinal and supraspinal mechanisms of pain control, beyond Melzack and Wall's original theory. Although GCT greatly enhanced the understanding of the complexity of the pain experience and the potential consequences of unrelieved pain, it is largely a theory of acute pain. GCT cannot, for example, explain why a person develops chronic pain long after the original injury has healed.

Nervous System Plasticity: Peripheral and Central Sensitization

The role of plasticity of the nervous system in *peripheral and central sensitization* is now being recognized, along with the individuality of pain perception and response (Basbaum & Jessell, 2000). In the context of pain, **nervous system plasticity** refers to the fact that pain mechanisms in the PNS and CNS can change in response to continued noxious stimulation, a process known as **sensitization**. For example, **peripheral sensitization** of peripheral nociceptors can occur after injury, surgery, or inflammation because of chemicals released from damaged cells, such as bradykinin, histamine, and prostaglandins. Peripheral sensitization can change the properties of nociceptors so that they transmit spontaneous discharges and respond at a lowered threshold to both noxious and non-noxious stimuli (Basbaum & Jessell, 2000). Moreover, prolonged firing of nociceptors with severe or persistent injury, such as surgery, causes dorsal horn spinal cord neurons to become more responsive to all inputs, resulting in a phenomenon known as **central sensitization**. Central sensitization can result in abnormal interpretation of normal stimuli, the amplification or prolongation of the pain signal, and chronic pain that lasts long after the original trauma (Basbaum & Jessell, 2000). The two major neurotransmitters that play a role in this mechanism are (a) substance P and (b) glutamate. These neurotransmitters cause an increase in intracellular calcium levels and lower the threshold for the firing of an action potential (Argoff, Albrecht, Irving, & Rice, 2009; Khasabov et al., 2002; Latremoliere & Woolf, 2009). One of the possible consequences of central sensitization is **wind-up**, a condition where, because of the repeated firing of C fibres, the spinal cord neurons become hyperresponsive, and their receptive fields in the corresponding organs expand. As a result, the client may present with secondary hyperalgesia (Herrero, Laird, & Lopez-Garcia, 2000).

Factors Affecting the Pain Experience

Numerous factors can affect a person's perception of and reaction to pain as well as his or her preferences for treatment. These include the person's ethnic and cultural values, developmental stage, environment and support people, previous pain experiences, and the meaning of the current pain.

Ethnic and Cultural Values

Ethnic background and cultural heritage have long been recognized as factors that influence both a person's reaction to pain and the expression of that pain. Behaviour related to pain is a part of the socialization process.

CLINICAL ALERT

It is imperative that nurses are aware of their "hidden" biases in pain assessment, that is, biases that he or she may not be conscious of and that may cause the nurse to either under- or overestimate their clients' pain or to omit pain assessment altogether. These biases may include the client's physical appearance, gender, age, race, or culture, as well as the nurse's personal experiences with pain.

In addition to some variations in pain threshold, cultural background can affect the level of pain that an individual is willing to tolerate. In some Middle Eastern and African cultures, self-infliction of pain is a sign of mourning or grief. In other groups, pain is anticipated as part of the ritualistic practices, and therefore, tolerance of pain signifies strength and endurance. Moreover, the expression of pain varies widely. Studies have shown that individuals of northern European descent tend to be more stoic and less expressive of their pain than individuals from southern European backgrounds. Persons of Asian descent, especially those of Chinese origin, may believe that pain is an essential part of life and tend to underreport their levels of pain (Gordon, 1997; IASP, 2001; Kumasaka, 1996; Munoz & Luckmann, 2005).

Nurses must realize that they have their own attitudes and expectations about pain (see the Clinical Alert box above). For example, nurses may place a higher value on silent suffering or self-control in response to pain. Nurses expect people to be objective about pain and to be able to provide a detailed description of the pain. Since many clients have individual and cultural differences in pain reporting and in treatment preferences, the nurse must be competent to elicit a report and to accurately assess pain in each of their clients. To become culturally competent, nurses must become knowledgeable about differences in the meaning of and appropriate responses to pain in their client's culture while being sympathetic to their concerns and developing the skills needed to address pain in a culturally sensitive way.

Developmental Stage

The ages and developmental levels of clients are important factors that will influence their reactions to and expressions of pain. Some age variations and related nursing interventions are presented in Table 30.3.

The field of pain management for infants and children has grown significantly over the past years. It is now accepted that anatomical, physiological, and biochemical elements necessary for pain transmission are present in newborns, regardless of gestational age (Bartocci, Bergqvist, Lagercrantz, & Anand, 2006; Grunau Re Fau-Holsti et al., 2005; Hall & Anand, 2005; Slater et al., 2006). However, children's pain is often undertreated because they may be less able to articulate their pain experience and needs compared with adults (Ellis et al., 2002; Stevens, 1999).

The likelihood of experiencing pain increases with age as older adults are more likely to suffer from chronic conditions that can cause pain, such as arthritis, diabetes, and joint disorders (Kane, Ouslander, & Itamar, 2004; Ramage-Morin, 2008). In addition, as the body system ages, older adults may require more medical interventions, such as surgery, that may result in acute pain. Older adults may also experience age-related changes in nociception. Although current knowledge of how aging affects pain transmission and perception is incomplete, recent investigations showed that aging does affect central pain processing and pain pathway plasticity (Gibson & Farrell, 2004; Zheng, Gibson, Helme, & McMeeken, 2009). Certain changes in nociception may result in a higher pain threshold. For example, the transduction and transmission of the pain signal in the older adult may be impacted by a reduction in substance P and the density of myelinated and nonmyelinated fibres. The nurse should not conclude that an older adult has lower pain intensities. In fact, if such a client chooses to report pain, the nurse should be alerted by the possibility of a greater underlying pathology. In addition, older adults often have more than one source of pain and they may have trouble localizing and explaining it (American Geriatric Society, 2002; Ramage-Morin, 2008).

For clients of all ages, the nurse may attempt to assess pain by using self-report and observational or behavioural and physiological measures (Herr et al., 2006; von Baeyer & Spagrud, 2007). Ideally, the nurse should use a composite measure that includes self-report and one or more of the other indicators (Champion, Goodenough, von Baeyer, & Thomas, 1998). When self-report cannot be obtained (e.g., infants, preverbal children, children with cognitive impairment, and older adults), behavioural observation should be the primary source for pain assessment (Herr et al., 2006; von Baeyer & Spagrud, 2007).

Environment and Support People

The psychological state of a person can affect their attention to, and the interpretation and perception of, pain. The surrounding environment has been shown to greatly affect the psychological state of an individual; it can cause many reactions from relaxation to excitation and anxiety (Oberle et al., 1990). Notably, a strange environment, such as a hospital with its noises, lights, and activity, can compound the state of stress or anxiety (Topf, 2000). Although there is no proven causal relationship between anxiety and pain, being in an unfamiliar environment may

TABLE 30.3 Age Variations in the Pain Experience

Age Group	Pain Perception and Behaviour	Selected Nursing Interventions
Infant	Perceives pain Responds to pain with increased sensitivity Older infant tries to avoid pain; for example, turns away and physically resists	Give a glucose pacifier. Use tactile stimulation (e.g., gently rub the other side of the affected area). Play music or tapes of a heartbeat.
Toddler and preschooler	Develops the ability to describe pain and its intensity and location Often responds with crying and anger because child perceives pain as a threat to security Reasoning at this stage is not always successful May consider pain a punishment Feels sad May learn there are gender differences in pain expression Tends to hold someone accountable for the pain	Distract the child with toys, books, pictures. Involve the child in blowing bubbles as a way of "blowing away the pain." Appeal to the child's belief in magic by using a "magic" blanket or glove to take away the pain. Hold the child to provide comfort. Explore misconceptions about pain.
School-age child	Tries to be brave when facing pain Rationalizes in an attempt to explain the pain Responsive to explanations Can usually identify the location and describe the pain With persistent pain, may regress to an earlier stage of development	Use imagery to turn off "pain switches." Provide a behavioural rehearsal of what to expect and how it will look and feel. Provide support and nurturing.
Adolescent	May be slow to acknowledge pain Recognizing pain or "giving in" may be considered weakness Wants to appear brave in front of peers and not report pain	Provide opportunities to discuss pain. Provide privacy. Present choices for dealing with pain. Encourage music or TV viewing as a distraction.
Adult	Behaviours exhibited when experiencing pain may be gender-based behaviours learned as a child May ignore pain because to admit it is perceived as a sign of weakness or failure May use pain for secondary gain, for example, to get attention Fear of what pain means may prevent some adults from taking action	Deal with any misbeliefs about pain. Focus on the client's control in dealing with the pain. Allay fears and anxiety, when possible. Spend time with the client, and listen carefully.
Older adult	May perceive pain as part of the aging process May have decreased sensations or perceptions of the pain Lethargy, anorexia, and fatigue may be indicators of pain May withhold complaints of pain because of fear of the treatment, of any lifestyle changes that may be involved, or of becoming dependent May describe pain differently, that is, as "ache," "hurt," or "discomfort" May consider it unacceptable to admit to or show pain	Clarify misbeliefs. Encourage independence, whenever possible.

cause a psychological discomfort that can have an indirect effect on the affective component of pain and increase the psychological suffering of the person who is experiencing it (Oberle et al., 1990). In addition, it was shown that lonely persons who are without a support network may perceive pain as severe, whereas persons who have supportive people around perceive less pain. People who consider their family and friends supportive also show less pain behaviours and higher levels of activity and report lower levels of emotional distress (Jamison & Virts, 1990). Finally, satisfaction with perceived social support was shown to be associated with lower pain intensity and lower depression levels (Lopez-Martinez, Esteve-Zarazaga, & Ramirez-Maestre, 2008).

Expectations of society or significant others can affect a person's perceptions of and responses to pain. In some situations, for example, girls may be permitted to express pain more openly compared with boys. Family roles can also affect how a person perceives or responds to pain. For instance, a single mother supporting three children may ignore pain because of her need to stay on the job. The presence of support people often changes a client's reaction to pain. For example, toddlers often tolerate pain more readily when supportive parents or

nurses are nearby (Lopez-Martinez et al., 2008; Schiff, Holtz, Peterson, & Rakusan, 2001).

Past Pain Experiences

According to the adaptation model of pain, an individual's judgment of a pain signal is based on the stimulus, its contextual meaning, the motivational state of the subject, and a number of experiential factors (Rollman, 1979). This model implies that previous pain experiences can influence a client's response to pain. People who have personally experienced pain or who have been exposed to the suffering of someone close are often more threatened by anticipated pain than are people without a pain experience (Rollman, Abdel-Shaheed, Gillespie, & Jones, 2004).

Meaning of Pain

The meaning of pain can contribute to the overall pain experience (Arntz & Claassens, 2004; McGillion et al., 2007). Some clients may accept pain more readily than others, depending on the circumstances and the client's interpretation of its significance. A client who associates pain with a positive outcome may withstand it amazingly well. For example, a woman giving birth to a child or an athlete undergoing knee surgery to prolong his career may tolerate pain better because of the benefit associated with it. These clients may view pain as a temporary inconvenience rather than a potential threat or disruption to daily life.

In contrast, clients with unrelenting chronic pain may suffer more intensely. Chronic pain affects the body, mind, spirit, and social relationships in an undesirable way. Physically, the pain limits functioning and contributes to disuse or deconditioning. For many, changes in activities of daily living (e.g., eating, sleeping, toileting) also take a toll. The side effects of the various medications used to try to control pain also place a heavy burden on the sufferer's body. Socially, pain often strains valued relationships, in part because of the impaired ability to fulfill role expectations. Together, these changes caused by pain may create a sense of loss (e.g., loss of work, friends, identity, or pleasure) to the client and result in an exacerbation of the affective–motivation component of pain perception.

Mentally, individuals with chronic pain change their outlook, becoming more pessimistic, often to the point of helplessness and hopelessness. Mood often becomes impaired when pain persists: the sadness of being unable to do important or enjoyable activities combined with self-doubts and learned helplessness, can contribute to depression. The anxiety surrounding the timing of pain flares, the worry about the physical ability to do what is needed, and the uncertainty about coping with multiple competing demands (including pain control) can escalate emotionally, to the point of panic.

Spiritually, pain can be viewed in a variety of ways. It may be perceived as a punishment for wrongdoing, a betrayal by a higher power, a test of fortitude, or a threat to the essence of who the person is. As such, pain can be a source of spiritual distress or be a source of strength and enlightenment (Gatchel, Peng, Peters, Fuchs, & Turk, 2007).

Pain Assessment

Accurate pain assessment is the foundation of effective pain management. In fact, many health facilities are making pain assessment the fifth* vital sign (American Pain Society, 1999; Dahl, 2000). Because pain is a complex, subjective, and multidimensional experience, no simple method can objectively determine how much pain an individual experiences. Nurses should tailor pain assessments to the unique developmental levels, communication capabilities, and cultural needs of their clients.

In general, pain should be assessed on hospital admission and routinely thereafter, as well as before, during, and after therapeutic interventions (Canadian Pain Society [CPS], 2005). However, the extent and frequency of the pain assessment will vary according to the situation. For clients experiencing acute or severe pain, the nurse may focus only on location, quality, severity, and early intervention. Clients with less severe or chronic pain can usually provide a more detailed description of the experience. Frequency of pain assessment usually depends on the pain management intervention being used and the clinical circumstances. For example, in the initial postoperative period, pain is often assessed whenever vital signs are taken, which may be as often as every 15 minutes and then extended to every 2 to 4 hours. Following pain management interventions, pain intensity should be reassessed at an interval appropriate for the intervention. For example, following the intravenous administration of 2.5 mg of morphine, the severity of pain should be reassessed at the peak effect, which is within 10 to 15 minutes.

Because it has been found that many people will not voice their pain unless asked about it, pain assessments *must* be initiated by the nurse. Some of the many reasons why clients may be reluctant to report pain are listed in Box 30.2. Knowledge deficits and personal beliefs may underlie some of these reasons, especially those regarding pharmacological pain management interventions. When conducting pain assessments, it is essential that nurses listen to and rely on the client's perceptions of pain because pain is a subjective experience. Believing the person who is conveying their perceptions of pain is also crucial in establishing a sense of trust.

Whenever possible, the nurse should question the client about his or her pain experience. In the nonverbal

*The editors draw the readers' attention to the debate about the *fifth vital sign*—some argue that pain is the fifth vital sign, but others indicate that oxygen saturation is the fifth vital sign (see Chapter 29).

BOX 30.2 WHY CLIENTS MAY BE RELUCTANT TO REPORT PAIN

Some clients are hesitant to report pain for a number of reasons:

- Unwillingness to trouble staff who are perceived as busy
- Concern about being labelled as a complainer or "bad patient"
- Fear of the injectable route of analgesic administration—children, in particular
- Belief that pain is to be expected as part of the recovery process
- Belief that pain is a normal part of aging or a necessary part of life—older adults, in particular
- Belief that expressions of pain reveal weakness
- Difficulty expressing personal discomfort
- Concern about potential risks associated with opioid drugs (e.g., addiction)
- Fear about the cause of pain or that reporting pain will lead to further tests
- Concern about the possibility of unwanted side effects, especially of opioid drugs
- Concern that use of drugs now will render the drug inefficient if or when the pain becomes worse

client (i.e. infants, older adults with cognitive deficits, unconscious clients), the nurse will look for observational indicators to detect the presence of pain. The goal of pain assessment is to get a comprehensive description of this subjective experience.

Pain Assessment in Clients Able to Self-Report

The gold standard of pain assessment is the client's self-report (IASP, 1979). The nurse must provide an opportunity for clients to express, in their own words, how they perceive their pain. The commonly used mnemonic PQRSTU symptom assessment can help the nurse elicit questions during a pain assessment.

P: PRECIPITATING/PALLIATING FACTORS *Precipitating factors* are events that normally cause the pain or that aggravate it. For example, physical exertion may precede chest pain and cause muscle spasms in the neck, shoulders, or back; abdominal pain may occur after eating. These observations can help prevent pain and determine its cause. Environmental factors, such as extreme cold or heat, can affect some types of pain. For example, sudden exercise on a hot day can cause muscle spasm. Physical and emotional stressors can also precipitate pain. Strong emotions can trigger a migraine headache or an episode of angina. Some clients, especially those with chronic pain, may not be able to tell what brings on their pain. By working together with the client and going over their daily routines and events that precede the pain, a nurse may be able to help them determine whether their pain is related to any precipitating factors.

Assessing *palliating factors* consists of taking note of all the strategies that the client has tried to decrease the pain and whether or not they were helpful. These may include medical procedures, home remedies, such as herbal teas, medications, rest, applications of heat or cold, prayer, or distractions like watching television. It is important to explore the effect that both pharmacological and non-pharmacological strategies have had on the pain. This information may provide the nurse with valuable clues on how to tailor the client's pain management plan to his or her unique situation. Any side effects of pain-relieving strategies should also be documented.

Q: QUALITY/QUANTITY *Quality* refers to the client's description of the pain sensation. Descriptive adjectives help people communicate the quality of their pain and can provide information on the nature of the pain (i.e., nociceptive, neuropathic, or a combination of both). A headache may be described as "hammer-like" or an abdominal pain as "piercing, like a knife." Sometimes, clients have difficulty describing their pain because they have never experienced any sensation like it. This is particularly true for children, older adults, and adults who have neuropathic pain.

Nurses need to record the exact words clients use to describe pain. Exact information can be significant in both the diagnosis of the pain etiology and the treatment choices. For example, key descriptors, such as "burning" and "electrical," may help the nurse to identify neuropathic pain. To help gather information, a nurse can use a validated pain questionnaire (e.g., McGill Pain Questionnaire or MPQ; see Table 30.4 on page 753) (Melzack, 1975).

Quantity refers to pain intensity. Valid and reliable self-report measures of pain intensity include the 0–10 Numerical Rating Scale (NRS), the Visual Analogue Scale (VAS), the Verbal Rating Scale (VRS), and Faces Pain Scales (FPSs). Such scales provide consistency for nurses to communicate with the client and other health care providers (Jensen & Karoly, 1986). Nurses can affect the quality of the pain report by selecting pain scales that are appropriate for their target populations. Some clients may require the nurse to teach them how to use the scale or to fill in the pain assessment with them. Some of the commonly used pain scales are described below.

The NRS is widely used in clinical practice and consists of an 11-point scale from 0 (no pain) to 10 (worst possible pain) (Figure 30.4B). The VAS (Huskisson, 1983) consists of a 10-cm line with one end indicating "no pain" and the other end indicating "pain as bad as it could possibly be." The distance on the line is calculated in millimetres (from 0 to 100) (Figure 30.4A). The advantages of both scales include the ease of use, their applicability to many communicative client populations, and their sensitivity and validity. The VRS gives the client a list of adjectives that describe pain in a ranked order. Each adjective can also be assigned a score. For example, a VRS may consist of "no pain," "mild," "moderate," and "severe" pain that are assigned the scores of 0, 1, 2, and 3, respectively (Ohnhaus & Adler, 1975).

Various FPSs that are based on facial expressions associated with different pain levels have been developed. Each face can refer to a number to help document the pain intensity. Among them, the Faces Pain Scale—Revised (FPS-R) (Hicks, von Baeyer, Spafford, van Korlaar, & Goodenough, 2001), shown in Figure 30.4B, can be used with school-age children (Stinson, Kavanagh, Yamada, Gill, & Stevens, 2006). The Faces Pain Thermometer (FPT) depicted in Figure 30.4C was developed for use with adults (Gelinas, 2007).

Not all clients can understand or relate to numbers (i.e., NRS). These include children who are unable to verbally communicate their pain and clients with impairments in cognition or communication. FPSs may be easier to use for these clients (Hadjistavropoulos & Craig, 2002; Jensen & Karoly, 2001). For example, when measuring pain intensity in children, it is critical that the nurse use a self-report measure recommended for the child's age and developmental level.

Many scales, including the NRS, FPT, and FPS-R, have been shown to be valid and reliable when used with clients who have cognitive deficits (Taylor & Herr, 2003; Zhou, Petpichetchian, & Kitrungrote, 2011). Interestingly, it was noted that older adults find it easier to use the vertical pain intensity scale, rather than its horizontal version, because it reminds them of a thermometer (Herr & Mobily, 1993).

R: REGION/RADIATION Pain can be described according to where it is experienced in the body. *Radiating pain* is perceived at the source of the pain and extends to nearby tissues. For example, cardiac pain may be felt not only in the chest but also along the left shoulder and down the left arm. **Referred pain** is pain felt in a part of the body that is considerably removed from the tissues causing the pain. For example, pain from one part of the abdominal viscera may be perceived in an area of the skin remote from the organ causing the pain (Figure 30.5). Referred pain is complex and occurs most often with damage to visceral organs. The mechanisms of referred pain relate to the spatial organization of the grey matter of the spinal cord into five distinct laminae (I to V) or layers. It is thought that noxious stimuli from both somatic and visceral structures may converge via lamina V neurons, making it difficult for higher brain centres to discriminate the original sources of these noxious inputs (Basbaum & Jessell, 2000).

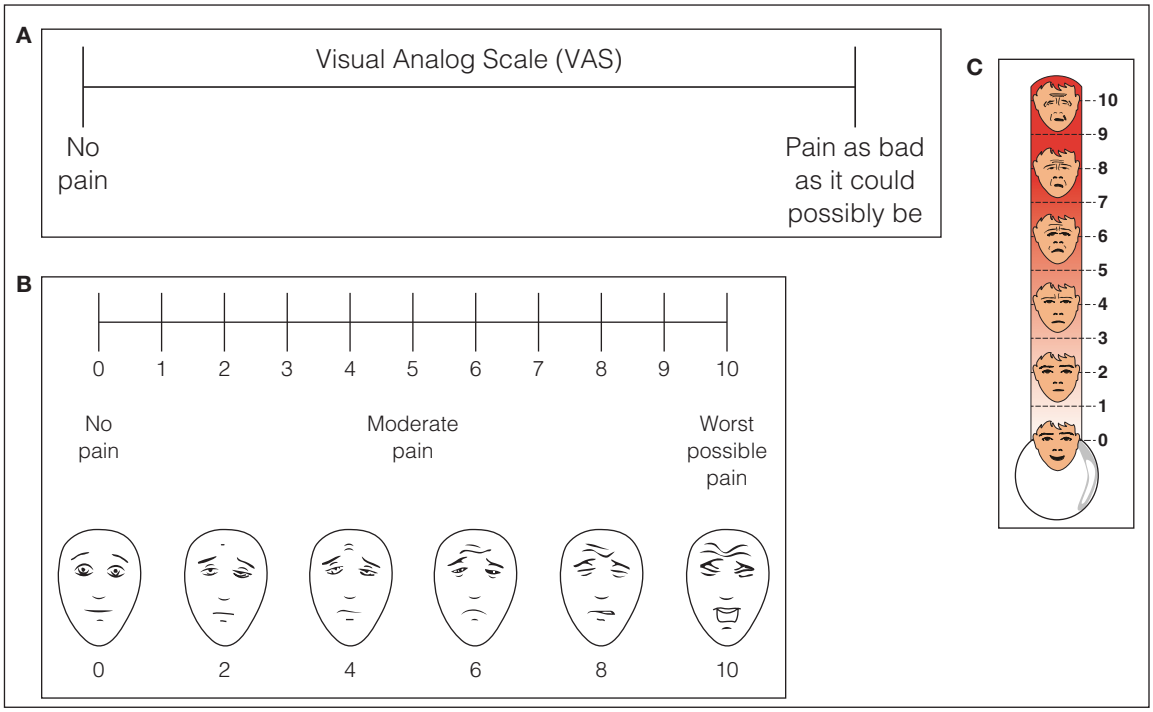

FIGURE 30.4 Commonly used self-report pain scales. **A:** The Visual Analogue Scale. **B:** The 0–10 Numeric Rating Scale (NRS) and the Faces Pain Scales-Revised (FPS-R) combined. **C:** The Faces Pain Thermometer. *Sources:* A and B: *From Pasero, C. & McCaffery, M. (2010).* Pain assessment and pharmacological management *(pp. 56–57). Mosby: St. Louis. A is in the public domain.* B *has been reproduced with the permission of the International Association for the Study of Pain. Permission to use the FPS-R for purposes other than clinical practice or research can be obtained by emailing IASPdesk@iasp-pain.org. The NRS is in the public domain.* C *The Faces Pain Thermometer from Gelinas, C. (2007). Le thermomètre d'intensité de douleur: Un nouvel outil pour les patients adultes en soins critiques.* Perspective infirmière, *4(4), 12–20. Permission by C. Gelinas.*

A: The Visual Analogue Scale (VAS). The client is asked to rate their pain on a 10-cm long line from "no pain" to "pain as bad as it could possibly be." The pain rating is calculated on the basis of how many millimetres the client's pain is removed from the "no pain" end of the line (e.g., 40 mm means the client's pain rating is 40 out of a possible 100).

B: The 0–10 Numeric Rating Scale (NRS) and the Faces Pain Scales-Revised (FPS-R) combined in a horizontal format. Clients may have a choice of the pain rating scale, when the scale is presented in this format. The left-most face shows "no pain," and the right-most face shows "very much pain." Clients are asked to point to the face that shows how much they hurt right now.

C: The Faces Pain Thermometer (Gelinas, 2007) has a vertical orientation that may be easier for older adults to use.

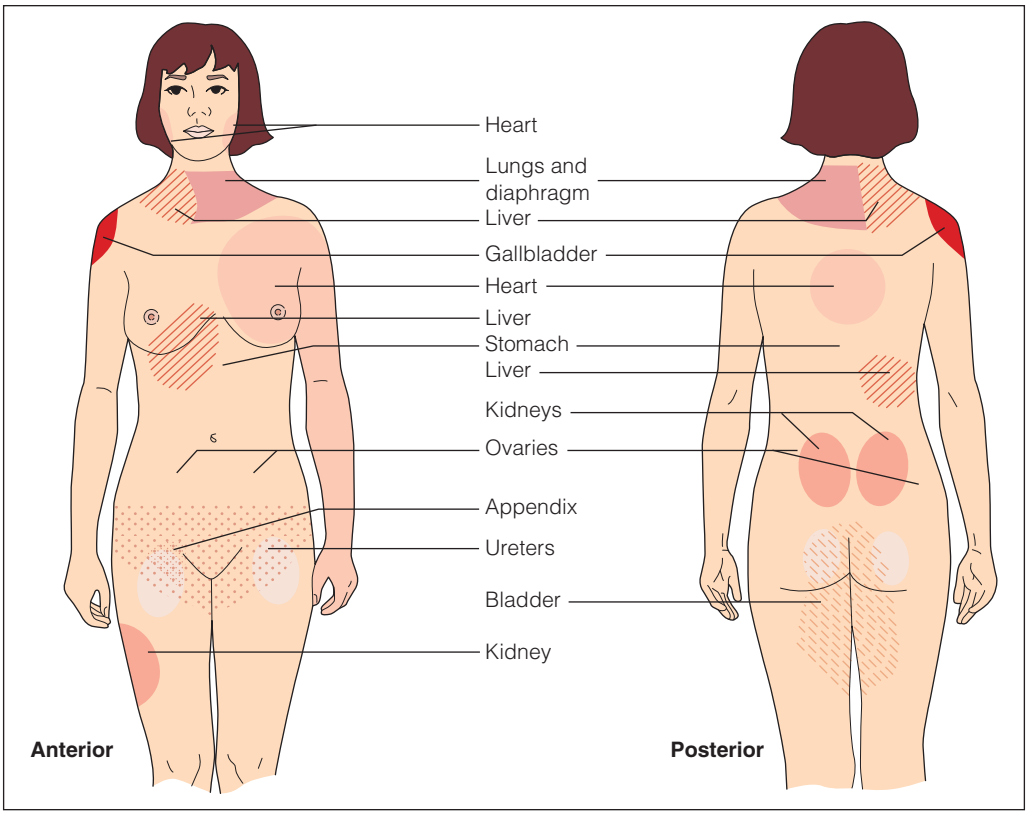

FIGURE 30.5 Common sites of referred pain from various body organs.

To ascertain the specific *location,* ask the individual to point to the site of the pain or discomfort. It is also important to determine whether the pain radiates from the indicated site. For example, a client with gall bladder colic may feel pain in the back and shoulder. A body outline can assist in identifying pain locations. The client marks the location of pain on the body outline. This tool can be especially effective with clients who have pain in more than one location.

S: SIGNS/SYMPTOMS Also included in a comprehensive pain assessment are signs (e.g., changes in vital signs, redness, edema, diaphoresis) and other associated symptoms, such as nausea, vomiting, and dizziness. These signs and symptoms may relate to the onset of the pain or they may result from the presence of the pain. Their description can also help in diagnosing the client's condition.

T: TIMING The pattern or timing of pain includes the time of onset, duration, and recurrence or intervals without pain. The nurse therefore determines when the pain began; how long the pain lasts; whether it recurs and, if so, the length of the interval without pain; and when the pain last occurred. With this information, the nurse can tailor pain interventions, such as analgesics administration, to precede the onset of pain. For example, a nurse might suggest taking an analgesic before exercise or physiotherapy to some clients.

U: UNDERSTANDING The assessment of understanding includes eliciting the client's opinion on what causes the pain, how it influences activities of daily living (ADLs), social life, the emotional significance of the pain, and the resources available to cope with the cumulative burden of pain on all aspects of the client's life.

It is important for the nurse to ask clients what they make of their pain. Many pain sufferers, especially those with chronic pain, will have a unique idea of why they are experiencing pain. Some clients may think that pain is a normal part of life or that it needs to be tolerated; others may think that their pain is caused by a specific event in their lives or even by their actions and behaviours.

Effect on Activities of Daily Living Knowing how ADLs are affected by pain helps the nurse understand the client's perspective on the pain's severity. The nurse asks the client to describe how the pain has affected the following aspects of life:

- Sleep
- Appetite
- Concentration
- Work or school
- Interpersonal relationships
- Marital relations and sex
- Home activities
- Driving or walking
- Leisure activities
- Emotional status (mood, irritability, depression, anxiety)

A rating scale of none, a little, or a great deal, or another range, can be used to determine the degree of alteration.

Client's History

In addition to the description of the pain experience using PQRSTU, the nurse needs to gather other information related to the client's history. AMPLE is an abbreviated client health history assessment that may help the nurse establish a picture of the client's health, present and past problems, and the events that may affect the client's condition. The letters in the AMPLE mnemonic correspond to the following:

- **A**llergies/reactions
- **M**edications/substances
- **P**ast medical history
- **L**ast meal
- **E**nvironment or events leading to the incident or illness

If this is a first encounter, a nurse must establish whether the client has allergies to medications, animals, fruits, vegetables, or environmental allergens, and the client's reactions to those allergies. Medication use (past and present) may affect a client's current status and also provide the nurse with clues about the client's current pain management regime (if any) and other medical problems. These may include prescription and over-the-counter medications, vitamins, and herbal remedies. It is also important to inquire whether the client consumes alcohol, nonprescription drugs, and tobacco; these substances may cause or affect many physical symptoms and can interfere with action of the medications that the client is prescribed. Past medical history includes questions about the past and present diagnoses, surgeries, injuries, and, if pertinent, family history of certain diseases. Last meal may be important as a precipitating factor in certain cases. For example, a client with epigastric pain may be suffering from gastroesophageal reflux or an ulcer that is aggravated by a large cup of coffee in the morning. Environment may refer to the client's social status, their living situation, or their work place. The pertinence of these questions should be determined by the nurse. For a client who has chronic back pain, it would be important to know about his or her work and whether the person has to lift heavy weights or to spend a long time sitting or standing. For acute pain, a nurse can also inquire about events leading to the incident, such as falling or having surgery. Examples of these questions are shown in the Assessment: Interview box.

Pain Questionnaires for Nursing Practice

Pain questionnaires are useful tools for a nurse to elicit a more descriptive picture of the client's pain, to organize it, and to make conclusions about possible nursing diagnoses related to pain. Some questionnaires have the ability to distinguish between different types of pain (e.g., neuropathic or somatic), whereas others can help the nurse understand the nature of the pain as it is experienced by the client. For example, the McGill Pain Questionnaire (MPQ) (Melzack, 1975) and its short-form (SF-MPQ) (Melzack, 1987; see Table 30.4) were shown to be reliable and valid multidimensional questionnaires of pain for different types of pain in adults. The Brief Pain Inventory (BPI) collects information about pain severity, treatment relief, and the effect of pain on key areas of function (general activity, mood, walking ability, normal work, relations with people, sleep, enjoyment of life). This tool is especially useful for initial pain assessment and tracking the progress of pain (Cleeland & Ryan, 1994; Wu, Beaton, Smith, & Hagen, 2010). Another commonly used pain questionnaire is the Leeds Assessment of Neuropathic

TABLE 30.4 Short-Form McGill Pain Questionnaire

Client's Name:			Date:	
	None	Mild	Moderate	Severe
Throbbing	0)	1)	2)	3)
Shooting	0)	1)	2)	3)
Stabbing	0)	1)	2)	3)
Sharp	0)	1)	2)	3)
Cramping	0)	1)	2)	3)
Gnawing	0)	1)	2)	3)
Hot-Burning	0)	1)	2)	3)
Aching	0)	1)	2)	3)
Heavy	0)	1)	2)	3)
Tender	0)	1)	2)	3)
Splitting	0)	1)	2)	3)
Tiring-Exhausting	0)	1)	2)	3)
Sickening	0)	1)	2)	3)
Fearful	0)	1)	2)	3)
Punishing-Cruel	0)	1)	2)	3)
	No pain		Worst Possible Pain	

PPI (Point Pain Intensity)

0 No Pain
1 Mild
2 Discomforting
3 Distressing
4 Horrible
5 Excruciating

Source: From Melzack, R. (1975). McGill Pain Questionnaire Pain, 1, *277–299. Reproduced with permission.*

ASSESSMENT INTERVIEW

It is important for the nurse to obtain accurate data on a client's pain. Examples of PQRSTU pain assessment questions:

- ***P****recipitating/****P****alliating (aggravating/alleviating) factors:* How did your pain start? What were you doing when the pain appeared? What makes the pain worse? What makes the pain better? What have you tried to alleviate your pain, and has it helped?
- ***Q****uality/****Q****uantity:* In your own words, describe what the pain feels like. Some of the descriptors the client may use are *burning, aching, dull, sharp, gnawing, shooting,* or *stabbing*. On a scale from 0 to 10 (with 0 meaning "No pain" and 10 meaning "Worst possible pain"), how would you rate the level of pain you are having?
- ***R****egion/****R****adiation:* Where do you feel the pain? (point/describe). Does the pain radiate to any other regions of your body?
- ***S****igns, ****S****ymptoms:* Do you have any swelling, redness, fever? Do you have any other symptoms or sensations (e.g., nausea, dizziness, blurred vision, shortness of breath, anxiety, fatigue) in addition to your pain?
- ***T****iming:* When did or does the pain start? How long have you had it, or how long does it usually last? How long are the pain-free periods, if there are any? What is the frequency of the pain attacks?
- ***U****nderstanding:* How do you interpret your pain? Have you felt a similar kind of pain before, and if so, can you describe the situation? What outcomes (implications) do you anticipate from this pain? What do you fear most about your pain? How does the pain make you feel (e.g., anxious, depressed, frightened, tired)?

The nurse must inform himself or herself about the client's health history to be able to perform a comprehensive assessment. Examples of AMPLE health history assessment questions are as follows:

- ***A****llergies/reactions:* Do you have any known allergies? Are you sensitive to any foods/products/environments? What is your reaction to the food/product/environment that you are allergic to?
- ***M****edications/substances:*
  - Do you take any prescription medications? If so, what is the name/dosage/reason for the prescription? When did you take the last dose?
  - Do you take any nonprescription medications, vitamins, or herbal supplements? (name/dose/reason/time of last dose)
  - Do you consume alcohol, smoke cigarettes, or use drugs? (quantity/frequency/since when?)
  - Are your vaccinations up to date? Type (tetanus, flu, hepatitis, etc.)
  - Do you drink caffeinated beverages (coffee, tea, energy drinks)? How much, and how many a day? At what time of the day?
- ***P****ast medical history:* Do you have a diagnosed medical problem? To your knowledge, do you have any diseases? If yes, what type? When were you diagnosed? Did you receive treatment? Is the problem still present? Are there medical problems in your family? Have you ever been hospitalized, and if so, for what reason/when? Have you ever had surgery? If yes, for what reason/when?
- ***L****ast meal:* When did you eat last? What did you eat before the incident? Did you tolerate the meal well? Do you follow a diet? If yes, what kind, and for what reason?
- ***E****nvironment/****E****vents leading to injury or illness:* Where do you live? Do you live alone? If not, who do you live with? What were you doing before the incident? Where do you work? Do you find work stressful? Do you have friends or family who can provide support? Do you feel well supported? What were you doing right before the pain started?

Symptoms and Signs (LANSS) used to differentiate between nociceptive and neuropathic pain when the pain pathology is unclear (Bennett, 2001; Kaki, El-Yaski, & Youseif, 2005).

Daily Pain Diary

For clients who experience chronic pain, a daily diary may help the client and the nurse identify pain patterns and factors that exacerbate or mediate the pain experience. In home care, the family or the caregiver can be taught to complete the diary. The record can include time or onset of pain, activity before pain, pain-related positions or behaviours, pain intensity level, duration of pain, and the use of pharmacological and nonpharmacological pain management strategies. Recorded data can provide the basis for developing or modifying the plan for care. For this tool to be effective, it is important for the client to use it routinely. Therefore, the nurse should educate the client and the family about the value and use of the diary in achieving effective pain control. Determining the client's abilities to use the diary is essential.

Pain Assessment in Clients Who Cannot Self-Report

Clients who are unable to self-report their pain are a particularly vulnerable group of clients that present multiple challenges in pain detection and control. Clients who may experience pain but are unable to communicate it, among others, include older adults with cognitive deficits, infants and preverbal toddlers, intubated or unconscious clients, and clients at the end of life (Hadjistavropoulos et al., 2007; Herr et al., 2006; Mularski et al., 2009).

Recommendations for pain assessment in the nonverbal client are described in the position statement of the American Society for Pain Management Nursing (ASPMN; Herr et al., 2006). The approach to pain assessment is hierarchical (see Box 30.3), with no single pain scale being sufficient by itself. Rather, pain assessment

BOX 30.3 HIERARCHICAL APPROACH TO PAIN DETECTION IN THE NONVERBAL CLIENT

1. Attempt to elicit the client's self-report of pain.
2. Search for potential causes of pain (e.g., pathological conditions or procedures that can cause pain, such as surgery, physiotherapy activities, turning and positioning, blood draws, pressure ulcers). Assume that pain is present if any pain-causing condition is identified.
3. Observe the client's pain behaviours. Use valid evidence-based behavioural pain scales developed for specific client groups and contexts.
4. Use surrogate reporting from family, parents, or caregivers.
5. Attempt an analgesic trial if the presence of pain is suspected. Administer appropriate analgesics and re-evaluate behaviours. If there is an improvement in a potentially pain-related behaviour, then pain was present.

Source: Herr, K., Coyne, P. J., Key, T., Manworren, R., McCaffery, M., Merkel, S., Pelosi-Kelly, J., & Wild, L. (2006). Pain assessment in the nonverbal patient: Position statement with clinical practice recommendations. Pain Management Nursing, *7(2): 44–52.*

should be based on a combination of pain evaluation techniques. Attempting to elicit the client's self-report is encouraged in all clients.

BEHAVIOURAL RESPONSES TO PAIN People show wide variations in *behavioural responses* to pain. In the case of clients who are very young, aphasic, confused, or with altered levels of consciousness, nonverbal expressions may be the only means of communicating pain. Facial expression is often the first indicator of pain, and it may be the only one. Frowning, brow lowering, eyes tightly closed, clenched teeth or open mouth, and grimacing may be indicative of pain (Prkachin, 1992). Vocalizations, such as moaning, groaning, crying, or screaming, are also associated with pain (Mateo & Krenzischek, 1992). A client who remains immobile with the purpose of avoiding pain related to movements may also indicate pain (Puntillo et al., 1997). The client with chest pain often holds the left arm across the chest. A person with abdominal pain may assume the position of greatest comfort, often flexing the knees and hips and moving reluctantly.

Purposeless or rhythmic body movements are other cues of pain. For example, clients may toss and turn in bed or fling their arms about. Involuntary movements, such as a reflexive jerking away from a needle inserted through the skin, may also indicate pain (Feldt, 2000; Odhner, Wegman, Freeland, Steinmetz, & Ingersoll, 2003). An adult may be able to control this reflex; however, a child may be unable or unwilling to do so. An adult or child may assume the fetal position and rock back and forth when experiencing abdominal pain (Cohen et al., 2008). Rubbing an affected area is also a known pain indicator (Feldt, 2000). During labour, a woman may massage her abdomen rhythmically with her hands.

Behavioural changes, such as confusion and restlessness, may be indicative of pain in both cognitively intact and cognitively impaired older adults. A change in behaviours with others including becoming hostile or aggressive may also be observed in older adults with chronic pain (Gibson & Helme, 2001; Odhner et al., 2003).

It is important to note that some behavioural responses can be controlled, and the nurse must develop competent interpersonal observation skills to detect reflexive pain behaviours (Hadjistavropoulos & Craig, 2002; Hadjistavropoulos et al., 2007). For example, vocalization or body movements in response to pain can be controlled, but facial expressions, especially the reflexive movements of the upper face, were shown to be under less conscious control (Rinn, 1984). Also, many behavioural responses (e.g., crying) are not unique to pain. When pain is chronic, overt behavioural responses are rare, as pain behaviours habituate over time, and the individual develops personal coping styles for dealing with the pain. When looking for indicators of chronic pain, the nurse can focus on changes in the patterns of daily living, such as sleep, appetite, activity levels, social interactions, and avoidance behaviours (Shankland, 2011).

Valid and reliable assessment tools can be used to measure a client's behavioural responses to pain. Currently, no behavioural observation tool is acceptable for all client populations. Indeed, a pain assessment tool can only be shown to be valid when used for a specific purpose in a specified group of respondents and in a given context (American Educational Research Association, American Psychological Association, & National Council on Measurment in Education, 1999). The scope of this chapter cannot provide an exhaustive list of the available behavioural pain assessment tools. The Pain Resource Center at the City of Hope (http://prc.coh.org/PAINNOA.htm) provides a summary and critiques of the existing pain tools for nonverbal adult clients. A few examples of pain assessment tools developed for nonverbal client groups are described in Table 30.5.

PHYSIOLOGICAL RESPONSES TO PAIN Elevated or lowered vital signs as well as changes from the client's baseline may indicate but are not specific to pain. Early in the onset of acute pain, the sympathetic nervous system is stimulated, resulting in increased blood pressure, heart rate, respiratory rate, pallor, diaphoresis, and pupil dilation. Although the nociceptors do not adapt to painful stimuli, the sympathetic nervous system does, making the physiological responses less evident or even absent. With visceral pain, signs of parasympathetic stimulation may be observed, such as decreased blood pressure and heart rate, pupil constriction, and warm dry skin (McCance & Huether, 2006). Physiological responses are likely to be absent in people with chronic pain because of CNS adaptation (McEwen, 2001).

The evidence supporting the use of vital signs as valid indicators of pain is varied. Vital signs can be affected by many physiological and psychological changes other than pain (e.g., distress, medication, biochemical changes in the body, medical conditions). Therefore, vital signs alone should not be used as pain indicators, but, rather, they should be used as cues to prompt for further pain

TABLE 30.5 List of Behavioural Pain Assessment Scales

FLACC (Face, Legs, Activity, Cry, and Consolability)	A five-item scale; each item is scored from 0 to 2 with final scores from 0 to 10. Developed for infants and children from 2 months to 7 years old and used to quantify pain behaviours in children who cannot verbalize the presence of pain or its severity during or after a variety of surgical and medical procedures (Merkel, Voepel-Lewis, & Malviya, 2002; Merkel, Voepel-Lewis, Shayevitz, & Malviya, 1997).
PIPP (Premature Infant Pain Profile)	A seven-item scale scored from 0 to 21, developed for premature and term neonates and used for the detection of acute pain in neonates and the assessment of procedural pain in the neonatal intensive care unit (NICU; Ballantyne, Stevens, McAllister, Dionne, & Jack, 1999; Stevens, Johnston, Petryshen, & Taddio, 1996; Stevens, Johnston, Taddio, Gibbins, & Yamada, 2010).
CPOT (Critical-Care Pain Observation Tool)	A four-item scale scored from 0 to 8 developed for critically ill adults who are mechanically ventilated or not and used for the detection of pain in medical, surgical, and trauma ICUs (Gelinas, Fillion, Puntillo, et al., 2006; Gelinas & Arbour, 2009; Gelinas & Johnston, 2007). The scale is easy to use while it describes four behavioural domains.
BPS (Behavioral Pain Scale)	A three-item scale scored from 3 to 12 developed for critically ill and mechanically ventilated adults and used for the detection of pain in medical, surgical, and trauma ICUs (Payen, Bru, Bosson, et al., 2001).
Doloplus	A 10-item scale with each item scored from 0 to 3 with a maximum score of 30. Developed for older adults with cognitive impairment, including nonverbal older adults and mainly used in the chronic care settings (Torvik et al., 2010; Wary, Serbouti, & Doloplus, 2001).
PACSLAC (Pain Assessment Checklist for Seniors with Limited Ability to Communicate)	A checklist of 60 items developed for older adults whose communication capacity is limited because of dementia. The scale is intended for the use by caregivers, and it was developed based on the observations of behavioural (facial and body movements or aggression) as well as ADL changes (eating/sleeping) and includes physiological indicators (Fuchs-Lacelle & Hadjistavropoulos, 2004).

assessment and in conjunction with other pain assessment tools (Herr et al., 2006).

Diagnosing

When writing a diagnostic statement related to pain, the nurse should specify the location (e.g., right ankle pain, or left frontal headache), etiological factors and precipitating factors, when known, and may include both physiological and psychological factors. For example, in addition to the injurious agent, related factors may include knowledge deficit of pain management techniques or fear of drug tolerance or addiction. Examples of a few possible nursing diagnoses related to pain include acute moderate somatic pain related to surgical repair of right hip fracture and movement; chronic neuropathic pain interfering with quality of life and mental status; ineffective acute visceral pain management related to fear of analgesics and personal beliefs about the need to endure pain regardless of its intensity; insomnia, impaired physical mobility, and social isolation related to allodynia; high pain tolerance when experiencing visceral anginal pain negatively impacting on client's use of nitroglycerine potentiating the risk of myocardial infarction; risk of unintentional injury (e.g., scald, cut) related to reduced nociception from peripheral nerve block.

Planning

The established goals will vary according to the diagnosis, but possible examples include the following:

- Modify or minimize pain to enable partial or complete resumption of daily activities.
- Enhance abilities to control pain or to cope with pain.
- Demonstrate actions to control pain and associated symptoms.

Examples of desired outcomes for each of these goals, although established in the planning phase, are provided in Table 30.10 in the "Evaluating" section of this chapter.

Examples of nursing interventions to assist clients experiencing pain include specific nursing activities associated with each of these interventions, which can be selected to meet the individual needs of the client. See the "Implementing" section of this chapter for details. A Sample Nursing Care Plan is provided on the next page.

When planning, nurses need to choose pain relief measures appropriate for the client on the basis of the assessment data and input from the client or support persons. Nursing interventions can include a variety of pharmacological and nonpharmacological pain management strategies. Developing a plan that incorporates a wide range

Sample Care Plan for Acute Pain

Assessment Data

Nursing Assessment

Mr. Chin is a 57-year-old Chinese-Canadian businessman who was admitted to the surgical unit of an urban hospital for the treatment of a strangulated inguinal hernia. Two days ago, he had a partial bowel resection. Postoperative orders include NPO (no food orally), intravenous infusion of 5% dextrose in 0.45% sodium chloride (D5 1/2NS) at 125 mL/h left arm, nasogastric tube to low intermittent suction with continuous drainage of 20–30 mL/h. Mr. Chin is in the dorsal recumbent (supine) position and is attempting to draw up his legs. He appears restless and is complaining of pain (7 on a scale of 0 to 10) along his abdominal incision line; he describes the pain as "throbbing" and aggravated by movement and coughing—as a result, he is not using his incentive inspirometer and avoiding getting out of bed; alleviated somewhat (5/10) with splinting (he "hugs" a pillow); no radiation; accompanied by nausea and poor quality of sleep; his understanding of the pain is: "It is expected after a big operation—I will try not to move too much, and it will likely go away on its own in a couple of days. I don't want to be a bother to anyone."

Physical Examination

Height: 188 cm

Weight: 90 kg

Body mass index (BMI): 25.5

Temperature: 37°C Oral

Heart rate: 90 beats/min, 2+ amplitude, regular

Respirations: 24/min, shallow

Blood pressure: 158/82 mm Hg

Oxygen Saturation (SpO_2): 96%

Skin pale, pupils dilated; intact midline abdominal incision, sutures dry, no exudate, no erythema along wound edges

Diagnostic Data

Chest x-ray and urinalysis negative, white blood count (WBC) 6.2×10^9/L

Nursing Diagnosis

Acute severe somatic pain related to surgical incision stimulation of mechanosensitive receptors; accompanied by behavioural (grimacing, restlessness), and physiological cues (e.g., elevated pulse, respirations, systolic blood pressure; and dilated pupils); Mr. C.'s coping strategy of limiting physical activity to deal with the uncontrolled acute pain places him at risk for postoperative complications (e.g., atelectasis, urinary retention, venous thromboembolism); nausea could lead to vomit increasing intra-abdominal pressure placing client at risk for wound dehiscence; his fear of being a burden may limit his disclosure of pain or request for help in managing it. *Strengths*: No apparent signs/symptoms of wound infection (a possible reason for incisional pain); nasogastric tube is patent (a blocked nasogastric [NG] tube can cause abdominal distension and visceral pain)

Client Goal

Client goal

The client will experience minimal incisional pain and discomfort.

Desired Health Outcomes

1. Pain control as evidenced by demonstrating willingness and ability to report pain to the health care team and use pharmacological and nonpharmacological pain relief measures appropriately.
2. Pain level controlled as evidenced by no or mild reported pain; increased movement and use of inspirometer, decreased nausea, protective body positioning; return to baseline of blood pressure (BP), heart rate (HR), respirations (R).

Nursing Interventions and Selected Activities with Rationales

Pain Assessment and Management	Rationale
• Perform ongoing comprehensive pain assessment using PQRSTU.	*Pain is a subjective experience and, whenever possible, must be described by the client to plan and monitor treatment; ongoing assessment will ensure that the nurse monitors the pain in the event that Mr. Chin continues to underreport it.*

(continued)

Sample Care Plan for Acute Pain (continued)

Nursing Interventions and Selected Activities with Rationales

Pain Assessment and Management	Rationale
• Consider cultural influences on Mr. Chin's pain response (e.g., cultural beliefs about pain can result in a stoic attitude).	*Each person experiences and expresses pain in an individual manner by using a variety of sociocultural adaptation techniques.*
• Reduce or eliminate factors that may precipitate or worsen Mr. Chin's pain experience (e.g., fear, fatigue, blocked NG tube, abrupt movements).	*Personal factors can influence pain and pain tolerance. Those factors that may be precipitating or increasing pain should be reduced or eliminated to enhance the overall pain management program.*
• Teach the use of nonpharmacological techniques (e.g., relaxation, guided imagery, music therapy, distraction) before, after, and, if possible, during potentially painful activities (e.g., deep breathing and coughing exercises, wound care, ambulation); before pain occurs or increases; and along with other pain relief measures.	*The use of nonpharmacological pain relief measures can increase the release of endorphins and enhance the therapeutic effects of analgesics.* *Each client has a right to expect maximum pain relief. Optimal pain relief is achieved by using analgesics includes determining the preferred route, drug, dosage, and frequency for each individual.*
• Medicate before an activity to increase participation, but evaluate the hazard of sedation.	*Turning and ambulation activities will be enhanced if pain is controlled.*
• Evaluate the effectiveness of the pain control measures used through ongoing assessment of Mr. Chin's pain experience.	*He is at risk of silently tolerating the pain if not specifically asked about it. It is therefore important that the nurse routinely assesses pain.*
Analgesic Administration	
• Check the prescription for drug (e.g., opioid, nonsteroidal anti-inflammatory drug [NSAID], other), dose, route, and frequency of analgesic prescribed.	*The choice of analgesia varies with the type of pain (e.g., acute, chronic, neuropathic) and the quantity (e.g., mild, moderate, severe), and client variables, such as renal and liver function. Around-the-clock (rather than "as-needed") analgesia provides better control for acute somatic pain.* *Mr. Chin will not be able to receive oral analgesia as long as he has a draining NG tube—topical, rectal, and parenteral (e.g., subcutaneous) routes must be used.*
• Institute regular dosing (around-the-clock) and monitoring, as appropriate, relative to the analgesic pharmacodynamics and pharmacokinetics.	
• Evaluate the effectiveness of the analgesic at regular, frequent intervals after each administration at the peak effect and especially after the initial doses, also observing for any signs and symptoms of untoward effects (e.g., sedation, respiratory depression, nausea and vomiting, dry mouth, and constipation).	*The analgesic dose may not be adequate to achieve pain control or may be causing intolerable or dangerous side effects or both. Ongoing evaluation will assist in making necessary adjustments for effective pain management.*
• Encourage Mr. Chin to communicate before his pain is at a 4/10 or greater and request prn (as needed) analgesia for breakthrough pain.	*Severe pain is more difficult to control and requires around-the-clock administration of analgesia as well as additional "as-needed" analgesia until pain is better controlled. Mr. Chin is already reluctant to report his pain, so ongoing encouragement may help him reduce his concerns of being a burden.*
• Document Mr. Chin's response to analgesics and any untoward effects. Implement actions to decrease untoward effects of analgesics (e.g., constipation, urinary retention).	*Side effects of opioid narcotics, among others, include drowsiness, sedation, constipation, and urinary retention. A treatment plan to prevent occurrence of side effects and their monitoring should be instituted at the beginning of analgesic therapy.*
Nonpharmacological pain relief measures	
• Inquire if Mr. Chin has a preference for the type of strategy to be used. Investigate if he is receptive to nonpharmacological pain management strategies other than splinting, such as relaxation therapy.	*Mr. Chin may have preferences for nonpharmacological pain management strategies. He has already learned that splinting is helpful and may have other preferred pain management strategies that he practises at home.*

Pain Assessment and Management	Rationale
• Consider Mr. Chin's willingness and ability to participate, preference, past experiences, and contraindications before selecting a specific relaxation strategy.	*The client must feel comfortable trying a different approach to pain management. To avoid ineffective strategies, the client should be involved in the planning process.*
• Elicit conditioned behaviours that produce relaxation, such as deep breathing, peaceful imaging, or meditation.	*Relaxation techniques help reduce skeletal muscle tension and anxiety, which will reduce the intensity of the pain.*
• Create a quiet, nondisruptive environment with dim lights and comfortable temperature, when possible.	*Each person may find different images or approaches to relaxation more helpful than others.*
• Demonstrate and practise the relaxation technique with Mr. Chin, if he is agreeable.	*Return demonstrations by the participant provide an opportunity for the nurse to evaluate the effectiveness of teaching sessions.*
• Discuss the possible use of distraction (e.g., reading, Sudoku, television).	*Distraction reduces the perception of nociception.*
• Evaluate and document his response to relaxation therapy.	*Conveys to the health care team effective strategies in reducing or eliminating pain.*

Evaluation

Outcomes partially met. Mr. Chin accepted "around-the-clock" parenteral analgesia with his pain dropping to 2–3/10 about 30 minutes after analgesia; although he originally requested breakthrough analgesic in the daytime, he did not ring his call bell in the night to obtain additional analgesia and awoke with pain 6/10; in addition, when asked if he had pain, he continued to underreport its effects. His use of the incentive inspirometer increased, but he continued to limit his coughing and activity in bed. He attempted to use distraction and found that watching TV was most helpful; he did not like the rhythmic breathing activities but was able to start using meditation techniques that he had learned in the past. Ongoing use of his splinting technique continued.

of interventions is usually most effective. Whether in acute care or in home care, it is important for everyone involved in pain management to understand the plan of care. The plan should be documented in the client's record; in home care, a copy needs to be made available to the client, support persons, and caregivers. Involvement of the client and support persons is essential in pain management.

When the client's pattern and level of pain can be anticipated or is already known, regular or scheduled administration of analgesics can provide a therapeutic plasma level. The importance and meaning of a stable drug level in pain management should be explained to the client. With acute pain, this may be possible in the first 24 to 48 hours following surgery, when the client is likely to have pain requiring opioid analgesics. Frequency of administration can be adjusted to prevent pain from recurring. When persistent cancer-related pain exists, analgesics should be given around the clock (ATC) with additional breakthrough (as needed: prn) doses available. Nonpharmacological interventions should also be regularly scheduled. The additional advantage of scheduling measures is that the client spends less time in pain and does not experience the anxiety or fear of the pain recurring.

Planning for Home Care

In preparation for discharge, the nurse needs to determine the client's and family's needs, strengths, and resources. The Assessment: Home Care box describes the specific assessment data required when establishing a discharge plan. By using the assessment data, the nurse tailors a teaching plan for the client and family (see the Teaching: Home Care box on monitoring pain that follows).

ASSESSMENT HOME CARE

PAIN

The nurse needs to determine the client's and family's ability to effectively cope with pain once the client is discharged:

CLIENT

- *Level of knowledge:* Mastery of pharmacological and nonpharmacological pain relief measures prescribed and selected; adverse effects and measures to counteract these effects; warning signs to report to health care provider
- *Self-care abilities for analgesic administration:* Ability and mental capacity to use analgesics appropriately (e.g., to prepare correct dosages of analgesics and adhere to scheduled administration); physical dexterity to take pills or to administer intravenous medications and to store

(continued)

ASSESSMENT HOME CARE *(continued)*

medications safely; ability to obtain prescriptions or over-the-counter medications at the pharmacy; and need for assistance in any one of the described tasks

FAMILY

- *Caregiver availability, skills, and willingness:* Primary and secondary persons able and willing to assist with pain management; shopping if the client has restricted activity; ability to comprehend selected therapies (e.g., infusion pumps, imagery, massage, positioning, and relaxation techniques) and perform them or assist the client with them, as needed
- *Family role changes and coping:* Effect on financial status, parenting and spousal roles, sexuality, social roles

COMMUNITY

- *Resources:* Availability of and familiarity with resources, such as supplies, home care aid, or financial assistance

TEACHING HOME CARE

Monitoring Pain

Understanding pain and monitoring it for changes are important tasks when a client returns home:

- Teach the client to keep a pain diary to monitor pain onset, activity before pain, pain intensity, aggravating and alleviating factors, use of analgesics or other pain relief measures.
- Instruct the client to contact a health care professional if planned pain control measures are ineffective or adverse effects arise and are problematic.

Pain Control

- Teach the use of selected nonpharmacological techniques, such as relaxation, guided imagery, distraction, music therapy, massage, and so on.
- Discuss the actions, potential adverse effects, dosages, frequency, and route of administration of prescribed analgesics.
- Suggest ways to handle adverse effects of medications and describe warning signs of medication overdose.
- Provide accurate information about tolerance, physical dependence, and addiction if opioid analgesics are prescribed and these topics are of concern.
- Instruct the client to use pain control measures *before* the pain becomes moderate to severe.
- Inform the client of the consequences of untreated pain.
- Demonstrate and have the client or caregiver redemonstrate appropriate skills to administer analgesics (e.g., skin patches, injections, infusion pumps, or patient-controlled analgesia [PCA]), when appropriate.

Resources

Nurses should provide appropriate information about how to access community resources, home care agencies, and associations that offer self-help strategies and educational materials. See the Weblinks section of this chapter for useful websites.

Generally speaking, a combination of strategies is best for the client in pain. Sometimes, strategies need to be tried and changed until the client obtains effective pain relief.

Implementing

Pain management is the alleviation of pain or a reduction in pain to a level of comfort that is acceptable to the client. It includes two basic types of nursing interventions: *pharmacological* and *nonpharmacological*. Nursing management of pain consists of both independent and collaborative nursing actions. In general, nonpharmacological pain relief measures can be executed as an independent nursing function, whereas administration of analgesic medications requires a physician's prescription. However, the decision to administer the prescribed medication is frequently the nurse's, often requiring judgment as to the dose to be given and the time of administration.

Barriers to Pain Management

Misbeliefs and knowledge deficits of nurses, other health care professionals, and clients can interfere with effective pain management. Some of these involve attitudes of the nurse or the client as well as knowledge deficits. Clients respond to pain on the basis of their culture, personal experiences, and the meaning the pain has for them. For many people, pain is expected and accepted as a normal aspect of illness and treatments, such as surgery. Clients and families may lack knowledge of the adverse effects of pain and may have misinformation and fears regarding the use of analgesics. Clients may not report pain because they expect nothing can be done, they think it is not severe enough, they do not want to take medication, or they feel it would distract or prejudice the health care provided. Other common misbeliefs are shown in Table 30.6.

Key Strategies in Pain Management

ACKNOWLEDGING AND ACCEPTING Basic to effective pain management is comprehensive pain assessment (see the "Assessing" section), which begins with believing the client. Four ways of communicating this belief follow:

1. Verbally acknowledge the presence of the pain, and use standardized measures to clarify pain intensity, quality, and impact.

TABLE 30.6 Common Misbeliefs about Pain

Misbelief	Correction
Clients experience severe pain only when they have had major surgery.	Even after minor surgery, clients can experience intense pain.
The nurse or other health care professionals are the authorities on a client's pain.	The person who experiences the pain is the only authority on its existence and nature.
Administering analgesics regularly for pain will lead to addiction.	Clients are unlikely to become addicted to an analgesic provided to treat pain.
The amount of tissue damage is directly related to the amount of pain.	Pain is a subjective experience, and the intensity and duration of pain vary considerably among individuals.
Unconscious or sedated clients cannot experience pain.	Unconscious or sedated individuals may still experience pain; recent evidence has shown that clients with altered levels of consciousness may have the ability for conscious pain perception (Boly et al., 2008; Laureys et al., 2002). The absence of pain-related behaviours in unconscious or sedated clients does not necessarily indicate absence of pain.
Visible physiological or behavioural signs accompany pain and can be used to verify its existence.	Even with severe pain, periods of physiological and behavioural adaptation can occur.

2. Listen attentively to what the client says about the pain, restating your understanding of the reported pain. Use empathetic statements, such as "I'm sorry you are hurting. It must be upsetting. I want to help you feel better."
3. Convey that you need to understand the client's pain experience and whether pain treatments are effective or not. Ask, for example, "Has the pain treatment reduced the intensity of your pain?"
4. Attend to the client's needs for pain relief promptly. It is unconscionable to believe the client's report of pain and then do nothing!

ASSISTING CAREGIVERS Caregiver persons often need assistance to respond positively to the client experiencing pain. Nurses can help by giving them accurate information about the pain and providing opportunities for them to discuss their emotional reactions, which may include anger, fear, frustration, and feelings of inadequacy. Enlisting the aid of support persons in the provision of pain relief to the client may diminish their feelings of helplessness and foster a more positive attitude toward the client's pain experience. Support persons also may need the nurse's understanding and reassurance, and perhaps access to resources that will help them cope as they add the caregiver role to an already stressful life circumstance.

REDUCING MISBELIEFS ABOUT PAIN Misbeliefs refer to incorrect beliefs that are thought to be true despite evidence to the contrary. It is important to recognize that people's beliefs about pain and their related responses to pain and treatments can be deeply entrenched in a complex array of contextual and societal factors. Reducing a client's misbeliefs about the pain and its treatment will help to guard against inadequate pain management. The nurse should explain to clients that the perception of pain is highly individualized and that they need to help clinicians understand their pain experience. Misbeliefs are also dealt with when nurses and clients have comprehensive discussions about the client's pain experience, including the intensity and quality of the pain, the impact of the pain, its aggravating and alleviating factors, and any fears and concerns the client may be struggling with, such as fears of opioid addiction, or common opioid adverse effects, such as constipation (Watt-Watson, 1992; Watt-Watson et al., 2001). Nurses must be aware of any personal misbeliefs that they may have about the client's pain. This includes becoming aware of any prejudices they may have and discarding them when caring for a client, educating themselves about different manifestations of pain, and getting to know the client and his or her background.

REDUCING FEAR AND ANXIETY It is important to address the meaning of pain, along with emotional components, such as anxiety or fear, associated with the pain experience. When clients have no opportunity to talk about the pain and associated fears, their perceptions and reactions to the pain can intensify; in particular, the meaning of pain can affect pain intensity (Arntz & Claassens, 2004). If the nurse establishes an effective pattern of assessment and communication and promptly attends to the client's pain-related needs, effective pain relief is more likely. By providing accurate explanations, the nurse can also reduce many of the client's fears, such as a fear of addiction or a fear that the pain will always be present.

PREVENTING PAIN A preventive approach to pain relief involves the provision of measures to treat the pain before it occurs or before it becomes moderate to severe. **Preemptive analgesia** is the administration of analgesics before an activity or an invasive or operative procedure to treat pain before it occurs. For example, evidence

suggests that treating clients perioperatively with local infiltration of an anesthetic or parenteral administration of an opioid can reduce postoperative pain and decrease the potential for the development of chronic pain (Katz, 2003). Intraoperative and postoperative administration of analgesics is also important for optimal pain relief. Nurses can use a preventative approach by providing analgesic as prescribed around the clock, rather than as needed.

Pharmacological Pain Management

Pharmacological pain management involves the use of opioids, NSAIDs, and coanalgesics (see Box 30.4).

Opioid Analgesics

Opioid analgesics include naturally occurring and synthetic opium derivatives, such as morphine and codeine. In clinical settings, opioids were commonly referred to as *narcotics*; this language is not appropriate, as narcotics include drugs not used for pain treatment. Opioids relieve pain by binding to opiate receptors in the spinal cord and by blocking its transmission to the brain where decreased pain level is perceived. Opioids also activate endogenous pain modulation in the CNS. Opiate receptors are of several different types, including mu (μ), delta (δ), and kappa (κ) receptors. The μ–opioid receptor is most commonly associated with pain relief. These drugs are prescribed by a physician or nurse practitioner practising under medical directive. The nurse requires knowledge of appropriate dose, duration of effect, time to onset, and strategies to manage adverse effects of opioid medications.

Opioids come in three primary types:

1. Full agonists. **Full agonists** bind to opioid receptors, mimicking the effects of endogenous opioids, or endorphins. Examples of full agonists include morphine, codeine, methadone, and hydromorphone. Meperidine (Demerol) is also a full agonist, but its use is *not recommended* (see the Clinical Alert box). Full agonists have no **ceiling dose**, the level at which increasing the dose results in no further increase in analgesia. Hence, their dose can be steadily increased to relieve pain.
2. *Mixed agonists–antagonists.* **Agonist–antagonist analgesic** drugs can act similar to opioids and relieve pain (agonist effect) when given to a client who has not taken any pure opioids. However, they can block or inactivate other opioid analgesics when given to a client who has been taking pure opioids (antagonist effect). These drugs include dezocine (Dalgan), pentazocine hydrochloride (Talwin), butorphanol tartrate (Stadol), and nalbuphine hydrochloride (Nubain). They block the μ–receptor site and activate a κ–receptor site. If a client has been receiving a μ-agonist (e.g., morphine) daily for more than a couple of weeks, the administration of a mixed agonist–antagonist may result in the inactivation of the morphine effect and in increased pain. These drugs have a **ceiling effect** (larger doses of a medication have progressively smaller incremental effects) that limits the dose. They are not recommended for use in terminally ill clients.
3. *Partial agonists.* **Partial agonists** have a ceiling effect. These drugs, such as buprenorphrine (Buprenex), block the μ–receptors or are neutral at that receptor but bind at a κ–receptor site. Buprenorphrine has good analgesic potency and is emerging as an alternative to methadone for opioid maintenance treatment programs.

Opioids are the most effective analgesic for the relief of moderate to severe pain and must be given on a regular basis to prevent pain from recurring. Acetaminophen is a nonopioid analgesic that is often used in a combination with a number of opioids, such as oxycodone and codeine.

BOX 30.4 CATEGORIES AND EXAMPLES OF ANALGESICS

The following are just some of the analgesics available (trade names are given in parentheses):

OPIOID ANALGESICS

- Fentanyl citrate (Duragesic)
- Oxycodone (OxyContin)
- Hydromorphone hydrochloride (Dilaudid)
- Morphine sulphate (morphine)
- Codeine (Tylenol No. 3)
- Methadone (Dolophine, Methadose)

NONOPIOID ANALGESICS

- Acetaminophen (Tylenol)
- Acetylsalicylic acid (Aspirin)
- Diclofenac sodium (Voltaren)
- Ibuprofen (Motrin, Advil)
- Indomethacin sodium trihydrate (Indocid)
- Naprosyn (Naproxen)
- Piroxicam (Feldene)
- Tolmetin sodium (Tolectin)
- Celecoxib (Celebrex)
- Ketorolac (Toradol)

COANALGESICS

- Antidepressants (amitriptyline [Elavil] nortriptyline [Aventyl])
- Anticonvulsants (carbamazepine [Tegretol], gabapentin [Neurontin], pregabaline [Lyrica])

CLINICAL ALERT

Nurses must challenge the general use of meperidine in the clinical setting. This drug has a short duration (2 to 3 hours), and its toxic metabolite, normeperidine, accumulates with repetitive dosing, causing CNS excitability and the lower seizure threshold. Several organizations issued cautions against the use of meperidine, including IASP and the Institute for Safe Medication Practices (ISMP) Canada. Meperidine use is still recommended for very few clinical cases, such as in the prevention and treatment of postoperative shivering and rigors caused by certain drugs and blood product administration; or for the management of acute pain episodes for clients with significant adverse reactions to other opioid analgesics (Ashley & Given, 2008; Dobbins, 2010). In these cases, meperidine should only be given if the frontline medications (e.g., clonidine or tramadol) are ineffective or cause an adverse reaction. Meperidine should never be given to clients with poor kidney function or those taking MAOI (monoamine oxidase inhibitor) medications (Daniel & Schmelzer, 2009; Pasero & McCaffery, 2010).

Adverse effects of opioids vary with the physiological state of the client. Box 30.5 provides suggested measures to prevent side effects of opioid analgesics. Respiratory depression is one of the most dangerous side effects of opioid administration, and if the client is not monitored and treated promptly, negative outcomes may occur (Box 30.6). As sedation is another common side effect, nurses should assess and document the client's level of awareness. If sedation is a problem, respiratory status must also be frequently monitored. Early recognition of an increasing level of sedation or respiratory depression will enable the nurse to implement appropriate measures promptly.

When administering opioids, it is important to distinguish among the effects of *tolerance, physical dependence,* and *addiction.*

TOLERANCE With **tolerance**, progressively larger doses are needed to produce the same analgesic effects. The consensus paper written by the American Academy of Pain Medicine (AAPM), the American Pain Society (APS), and the American Society for Addiction Medicine (ASAM) defines tolerance as a "state of adaptation in which exposure to a drug induces changes that result in a diminution of one or more of the drug's effects over time" (AAPM, APS, & ASAM, 2001). The full mechanism of tolerance is not well known. A possible theory suggests that it is caused by the progressive desensitization of opioid receptors (DuPen, Shen, Ersek, 2007). In humans, tolerance to certain opioid drug effects can start taking place on the first administration, but usually it is not clinically significant. Clinicians are more concerned about tolerance that happens over time with prolonged opioid administration and that requires increasingly high doses of the drug. The need for dose escalation is often misdiagnosed as tolerance; however, it can often be caused by disease or pain progression and not the body's adaptation to

BOX 30.5 COMMON OPIOID ADVERSE EFFECTS: PREVENTIVE AND TREATMENT MEASURES

Opioids can have a number of side effects that nurses can help to alleviate:

CONSTIPATION

- If the client's condition allows it, increase fluid intake (e.g., 6 to 8 glasses daily).
- Add more fibre and bulk-forming agents to the diet (e.g., fresh fruits and vegetables). Increased exercise is often ineffective in controlling this type of constipation.
- Administer prophylactic daily stool softeners combined with a mild laxative (e.g., senna [Senokot], docusate [Colace]) as a first line of prevention against constipation for clients on opioid maintenance therapy.
- Stimulants (e.g., bisacodyl), osmotic laxatives (e.g., lactulose, sorbitol, and polyethylene glycol), enemas (e.g., tap water and sodium phosphate), and even prokinetic agents (e.g., metoclopramide) may be needed for treating refractory constipation.

NAUSEA AND VOMITING

- Inform the client that tolerance to this emetic effect generally develops after several days of opioid therapy.
- Antiemetics (e.g., dimenHYDRINATE [Gravol], ondansetron [Zofran]) or gastrointestinal stimulants (e.g., metoclopramide) are sometimes prescribed to treat opioid-induced nausea. Changing the type of opioid or changing the dose and the route of administration can also help to reduce opioid-induced nausea and emesis is to (Laugsand, Kaasa, & Klepstad, 2011).

SEDATION

- Inform the client that tolerance usually develops over several days.
- Observe the client's frequency of respiration and oxygen saturation as their decreased values may indicate respiratory depression, a life-threatening side effect of opioid administration. See Box 30.6 for details.

PRURITUS

- Apply cool packs and lotion, and provide a diversional activity.
- Administer an antihistamine (e.g., diphenhydrAMINE hydrochloride [Benadryl]), as ordered. As with antiemetic medications, caution must be exercised if the client is prescribed an antihistamine because of its depressant effect on the CNS.
- Inform the client that tolerance to pruritus also develops.

URINARY RETENTION

- The nurse may need to catheterize the client or change or lower the opioid dose (Fernandes, da Costa, & Saraiva, 2007). The first steps in diagnosing urinary retention are abdominal examination (palpation and percussion), the observation of a client's intake and output (I&O), and performing a bladder scan (ultrasound).

BOX 30.6 OPIOID-INDUCED RESPIRATORY DEPRESSION

Definition

Opioid-induced respiratory depression is a decrease in the effectiveness of an individual's ventilatory function after opioid administration that is usually (but not always) preceded by sedation. It is characterized by poor respiratory effort (shallow breathing) and a respiratory rate below 10 breaths per minute.

Risk Factors

Physical and Lifestyle Characteristics

- Age >65 years (>55 years if client has sleep apnea)
- Hypertension
- Obesity (BMI >30 kg/m^2)
- Smoking (>20 pack/year)
- Untreated obstructive or central sleep apnea and their predisposing factors

Primary and Comorbid Medical Conditions

- Dependent functional status (unable to walk four blocks or two flights of stairs without assistance)
- Preexisting pulmonary or cardiac disease or dysfunction (e.g., history of chronic obstructive pulmonary disease [COPD] or heart failure)
- Major organ failure (e.g., decreased hepatic or renal function)
- Poor nutritional status

Medical Factors

- Prolonged surgery >2 hours
- Thoracic and other large incisions that may interfere with circulation
- Concomitant administration of other agents with a depressant effect on the central nervous system (antihistamines, benzodiazepines, some antiemetics)
- Large single-bolus techniques (e.g., 10 mg IV morphine)
- Continuous opioid infusion in opioid-naïve clients (those who have not recently received any opioid doses).
- Prior naloxone administration (naloxone is a short-acting medication, which puts clients at risk of repeated respiratory depression once the action wears off)
- Opioid-naïve clients who require large opioid administration
- Opioid-tolerant clients who are given large administrations of opioids in addition to their own opioid regimen
- General anesthesia (as opposed to other types of anesthesia)
- Timing of opioid administration (clients are at a greater risk in the first 24 hours)

Required Monitoring

Purposeful and systematic serial assessments of pain intensity, level of sedation, and respiratory status (quality, character, rate, and effectiveness).

- Pain intensity using a valid scale (refer the "Pain Questionnaires for Nursing Practice" section)
- Oxygenation (pulse oximetry)
- Capnography monitoring (end-tidal carbon dioxide [CO_2] measures)
- Respiratory rate (rhythm, rate, depth of chest excursion)
- Ventilation efficacy (depth and rhythm of respirations, snoring, loud breathing)
- Sedation status (e.g., Sedation-Agitation Scale [SAS], Ramsay Scale, Richmond Agitation and Sedation Scale [RASS], or Pasero Opioid-Induced Sedation Scale)

Treatment

- Immediately arouse all clients with signs of advancing sedation, poor respiratory effort, or noisy respiration (e.g., snoring)
- Instruct the client to take deep breaths (inspirometer may be used to motivate the client)
- Alert other members of the care team
- Monitor the client closely until the respiratory status is recovered
- Administer Naloxone as per hospital protocol, if needed

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

opioids (Pasero & McCafferey, 2010). Because full agonist opioids do not have a ceiling or maximum amount, drug tolerance should not preclude achievement of adequate analgesia, with incremental dosage increases as ordered. Many clients with nonprogressive pain are able to find a stable dose of opioids that provide adequate analgesia.

PHYSICAL DEPENDENCE With **physical dependence**, people experience a need to continue to use the drug to prevent symptoms of withdrawal. The AAPM, the APS, and the ASAM (2001, p. 2) define it as "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." Withdrawal symptoms can include vomiting, diarrhea, abdominal cramping, tremors, chills, diaphoresis, myalgia, arthralgia (joint pain not caused by inflammation), and coryza (inflammation of the mucous membranes of the nose). The term "dependence" is often used to describe a person who is addicted or has psychological dependence on the drug. Therefore, although it is appropriate to say that a person who has or could have withdrawal symptoms after the discontinuation of a drug is "physically dependent," the nurse must be careful to strictly avoid using the term "dependent" on its own.

Physical dependence and drug tolerance are involuntary behaviours and are the physiological result of frequent, ongoing opioid administration. Although physical dependence and tolerance develop, symptoms of withdrawal rarely occur because as pain decreases, the dosage is gradually tapered and no symptoms are experienced. *Physical dependence and drug tolerance do not represent addiction.*

ADDICTION No universally accepted definition of addiction to opioids exists. According to the AAPM, the APS, and the ASAM (2001, p. 2) **addiction** is characterized by the presence of adverse behaviours that feature a compulsion for the drug, craving, and a preoccupation with drug use predominantly for psychological effect, despite actual or potential harm. Determination of opioid addiction requires expert assessment of the client's history, risk factors for addiction, and potential biopsychological factors. Clinicians should not presume that clients' persistence or expression of the urgent need for pain relief is drug seeking or addictive behaviour. True opioid addiction is rare if opioids are prescribed and monitored appropriately. For most clients, opioid-seeking behaviours usually stop when the pain is adequately controlled. It is important to note that opioids can be effective for those with a history of chemical dependency on opioids; this requires prescription, supervision, and support by clinicians with expertise in pain management and chemical dependency. Guidelines for safe administration of opioids are available from a number of pain societies, such as the Canadian Pain Society and the International Association for the Study of Pain.

EQUIANALGESIC DOSING As nurses are responsible for evaluating the effectiveness of analgesics, monitoring for adverse effects, and advocating for change when an analgesic is not effective, it is important to understand the concept of **equianalgesia**, which refers to the relative potency of various opioid analgesics compared with a standard dose of morphine. An **equianalgesic dose** is the dose of one analgesic that has the same pain-relieving effect as another drug. This concept makes it possible to change one analgesic for another or to change the route of administration, for example, from parenteral to oral opioid doses. Equianalgesic dosing also allows comparisons to be made between weak analgesics, such as codeine, for mild pain, and stronger analgesics, such as morphine, for moderate to severe pain. See Table 30.7 for equianalgesic doses of common opioid medications.

The two basic techniques for calculating doses based on equianalgesic equivalents are (a) the ratio method and (b) the cross-multiplication method. For example, with the ratio technique, it is known that the oral–IV morphine ratio is 3:1, meaning IV morphine is three times as potent as oral morphine. Thus, a client who has required 100 mg of IV morphine per day will require 300 mg of oral morphine per day to control the same level of pain. If a different client who had an opioid requirement of 40 mg IV morphine per day were to be switched to oral

TABLE 30.7 Equianalgesic Chart for Some Common Opioids

Equianalgesic Dosages		
Opioid	**Oral**	**Parenteral**
Morphine	30 mg	10 mg
Codeine	200 mg NR	130 mg
Fentanyl*	—	100 µg/h (0.1 mg) is equal to 2–4 mg/h morphine IV
Hydromorphone	7.5 mg	1.5–2 mg
Meperidine	300 mg NR	75–100 mg
Methadone	20 mg	10 mg
Hydrocodone	30 mg	—
Oxycodone	15–20 mg	—

Note: For comparison, a dosage of 10 mg of parenteral morphine is established.
NR = not recommended.
**Fentanyl is also available in the transdermal route (Duragesic).*
Source: Critical Care Nursing of Older Adults: Best Practice, 3rd Edition. Marquis D. Foreman, Koen Milisen, Terry T. Fulmer. Copyright © 2010, Reproduced with the permission of Springer Publishing Company, LLC.

hydromorphone, the equianalgesia chart informs the nurse that 10 mg IV morphine is equivalent to 7.5 mg hydromorphone. By using the cross-multiplication technique (x represents the unknown dose), the following steps are calculated:

10 mg IV morphine = 7.5 mg oral hydromorphone
40 mg IV morphine = x mg hydromorphone
Cross-multiply:
$10x = 7.5 \times 40$
$10x = 300$
$x = 30$ mg hydromorphone

Thus, 30 mg of oral hydromorphone per day would provide equivalent analgesia to 40 mg of IV morphine per day. The hydromorphone dose is then divided on the basis of the duration of action of the available preparations (e.g., every 4 hours).

ROUTES FOR OPIOID DELIVERY Opioids have traditionally been administered by oral routes; subcutaneous routes, including continuous subcutaneous infusions; intramuscular routes; and intravenous routes. In addition, newer methods of delivering opioids, for example, transnasal, transdermal, and rectal drug therapy, as well as intraspinal infusion, have been developed; the traditional routes are not feasible with these new methods.

Oral Oral administration of opioids remains the preferred route of delivery because of ease of administration. Because the duration of action of most immediate-release (IR) opioids is approximately 4 hours, people with chronic pain have had to awaken several times during the night to medicate themselves for pain. To circumvent this problem, *long-acting,* or slow-release, forms of opioids with a duration of 8 to 12 hours have been developed. Examples of long-acting preparations are MS Contin, OxyContin, and Hydromorph Contin. Clients receiving long-acting preparations also require as-needed (prn) doses of IR analgesics (e.g., short-acting morphine, Percocet) for acute breakthrough pain.

Subcutaneous The subcutaneous (SC) route has been used extensively to deliver opioids, and another technique uses SC catheters and infusion pumps to provide *continuous subcutaneous infusion* (CSCI). The SC route is helpful for people who need long-term use of parenteral opioids and are unable to take opioids orally over the long-term, such as those experiencing dysphagia or gastrointestinal obstruction. CSCI involves the use of a small, light, battery-operated pump that administers the drug through a 23- or 25-gauge butterfly needle. The needle should be rotated between sites on the abdomen and thigh areas every 3 to 7 days. Client mobility can be maintained by attaching the pump to a belt, or using a shoulder bag or holster to hold the pump.

Because the client or the caregivers must operate the pump and change and care for the injection site, the nurse needs to provide appropriate instruction on assessment of pump functioning and care. Clients or their caregivers need to be able to do the following:

- Describe the basic parts and symbols of the system
- Identify ways to determine whether the pump is working
- Change the battery
- Change the medication
- Demonstrate stopping and starting the pump
- Demonstrate tubing care, site care, and changing of the injection site
- Identify signs indicating the need to change an injection site
- Describe general care of the pump when the client is ambulatory, bathing, sleeping, or travelling
- Identify actions to take when the alarm signals

Intramuscular The intramuscular (IM) route should not be used; it is the least desirable route for opioid administration because of variable absorption, pain involved with administration, and the need to repeat administration every 3 to 4 hours.

Intravenous The intravenous (IV) route provides rapid and effective relief of acute pain. The analgesic can be administered by continuous IV infusion, or by patient-controlled analgesia (PCA) (see the discussion on PCA later in this chapter).

Transnasal Transnasal administration has the advantage of rapid action of the medication because of direct absorption through the vascular nasal mucosa. A commonly used agent is the mixed agonist–antagonist butorphanol (Stadol) for acute headaches.

Transdermal Transdermal drug therapy is advantageous in that it delivers a relatively stable plasma drug level and is noninvasive. Fentanyl (Duragesic) is an opioid currently available as a skin patch with various dosages. It provides drug delivery for up to 72 hours. The time before the medication given via this route begins to take effect is between 12 to 16 hours; in the meanwhile, the client should be provided with short-acting opioids to relieve pain. The transdermal route is distinguished from the topical route in that the effects of the medications are systemic after the medication is absorbed; topical medications placed on the skin work locally at the point they are placed on the body.

Rectal Several opioids are now available in suppository form. The rectal route is particularly useful for clients who have dysphagia (difficulty swallowing), nausea, or vomiting.

Intraspinal An increasingly popular method of delivery is the infusion of opioids into the epidural or intrathecal (subarachnoid) space. Analgesics administered via the intraspinal route are delivered adjacent to the opioid receptors in the dorsal horn of the spinal cord. Two commonly used medications are morphine sulphate and

fentanyl. All medicines administered by the intraspinal route need to be sterile and preservative free (preservatives are neurotoxic). The major benefit of intraspinal drug therapy is superior analgesia with less medication used. The epidural space is most commonly used because the dura mater acts as a protective barrier against infection, including meningitis, and there is less risk of developing a spinal headache. Intraspinal catheters are not in constant contact with blood, and thus an infusion can be stopped and restarted later without the concern that the catheter is no longer patent.

Intrathecal administration delivers medication directly into the cerebrospinal fluid (CSF) that bathes and nourishes the spinal cord. Medicines quickly and efficiently bind to the opioid receptor sites in the dorsal horn when administered in this way, speeding the onset and peak effect, while prolonging the duration of action of the analgesic. An example of how the route of administration affects the relative potency of opioids is as follows: A client who needs 300 mg of oral morphine per day to control pain will need 100 mg of parenteral morphine, 10 mg of epidural morphine, and only 1 mg of intrathecal morphine in a 24-hour period. Very little drug is absorbed by blood vessels into the systemic circulation. In fact, the drug must circulate through the CSF to be excreted. As a result, onset of respiratory depression can be delayed (24 hours after the administration) as medication that has left the spinal opioid sites travels through the brain to be eliminated. Therefore, it is essential that the nurse continues diligent monitoring of respiratory depression in clients receiving intrathecal opioids.

In contrast, the epidural space is separated from the spinal cord by the dura mater, which acts as a barrier to drug diffusion. In addition, it is filled with fatty tissue and an extensive venous system. With this diffusion delay, some medications (especially fat-soluble medications, such as fentanyl) from the epidural space enter the systemic circulation via the venous plexus. Thus, a higher dose of opiate is required to create the desired effect, which can produce side effects, such as itching, urinary retention, and respiratory depression. Often, a mixture of an opioid (e.g., fentanyl) and a local anesthetic (e.g., bupivacaine) are combined to lower the dose of opioid needed. As a result, there may be an increase in fall risk for some clients who develop muscular weakness in their legs or orthostatic hypotension in response to the local anesthetic.

Intraspinal analgesia can be administered by three modes of operation:

1. *Bolus.* A single dose, or repeated bolus doses, can be provided. When clients have spinal anesthesia (e.g., during a cesarean section), a bolus of 1 mg intrathecal morphine can provide significant pain control for up to 24 hours. For shorter-acting medications, an epidural catheter may be intact and accessed by a qualified health care professional (e.g., anesthesiologist) to administer bolus doses on an as-needed basis. Check agency policy regarding who can provide these bolus doses, how they are documented, and the post-bolus monitoring procedures.
2. *Continuous infusion administered by pump.* The pump can be external (for acute or chronic pain) or surgically implanted (for chronic pain) to provide a continuous infusion of pain relievers into the epidural or intrathecal space.
3. *Continuous plus intermittent bolus.* With this mode of operation, the client receives a continuous infusion, with bolus rescue doses administered for breakthrough pain. Often, a pump with *patient-controlled epidural analgesia* (*PCEA*) capabilities is used for this mode of operation. This is similar to PCA (detailed later) in which a basal rate may or may not be used to meet the client's anticipated analgesic need, with the client's ability to request an incremental dose by pressing a button set at intervals. PCEA is often used to manage acute postoperative pain, chronic pain, and intractable cancer pain. The so-called *walking epidurals* used for women in labour are typically PCEA devices that are programmed in the bolus mode without a continuous infusion (basal rate) set.

The needle is inserted into the intrathecal or epidural space (typically in the lumbar region), and a catheter is threaded through the needle to the desired level. The catheter is connected to tubing that is then positioned along the spine and over the client's shoulder for the nurse to access. The entire catheter and tubing are taped securely to prevent dislodgement. Often, an occlusive transparent dressing is placed over the insertion site for easy identification of catheter displacement or local inflammation. Temporary catheters, used for short-term acute pain management, are usually placed at the lumbar or thoracic vertebral level and often removed after 2 to 4 days. Permanent catheters, for clients with chronic pain, may be tunnelled subcutaneously through the skin and exit at the client's side, or be connected to a pump implanted in the abdomen. Tunnelling of the catheter reduces the risk of infection and displacement of the catheter. After the catheter is inserted, the nurse is responsible for monitoring the infusion and assessing the client per institutional policy. Nursing care of clients with intraspinal infusions is summarized in Table 30.8.

There are misconceptions that either overstate or ignore the risks of spinal analgesia. This is, in part, due to the importance of the technique of the professional inserting the catheter, which varies considerably. In general, clients receiving epidural analgesia do not need to be monitored in an intensive care setting, but they do need vigilant assessment of their pain, neurological and

TABLE 30.8 Nursing Interventions for Clients Receiving Analgesics through an Epidural Catheter

Nursing Goal	Interventions
Maintain client safety	Label the tubing, the infusion bag, and the front of the pump with tape marked EPIDURAL to prevent confusion with similar-looking IV lines. Post a sign above the client's bed indicating that the epidural is in place. Secure all connections with tape. If there is no continuous infusion, apply tape over all injection ports on the epidural line to avoid the injection of substances intended for IV administration into the epidural catheter. Do not use alcohol in any care of catheter or insertion site, as it can be neurotoxic.
Maintain catheter placement	Secure temporary catheters with tape. When bolus doses are used, gently aspirate before medication administration to determine that the catheter has not migrated into the subarachnoid space. (Expect <1 mL of fluid return in the syringe.) Assist client in repositioning or moving out of bed. Assess insertion site for leakage with each bolus dose or at least every 8–12 hours.
Prevent infection	Use strict aseptic techniques with all epidural-related procedures. Maintain a sterile occlusive dressing over the insertion site. Assess the insertion site for signs of infection (e.g., redness, discoloration, secretions at the site, swelling, pain or fever [sign of a systemic infection]).
Maintain client's urinary and bowel functions	Monitor intake and output. Assess for bowel and bladder distension.
Prevent respiratory depression	Assess sedation level and respiratory status q1h for the first 24 hours and q4h thereafter. Do not administer other opioids or central nervous system depressants, unless ordered. Keep a 0.4-mg ampule of naloxone hydrochloride (Narcan) at the client's bedside. Notify the clinician in charge if the respiratory rate falls below 8 per minute or if the client is difficult to rouse.

respiratory status, and the insertion site frequently during the course of therapy.

PATIENT-CONTROLLED ANALGESIA **Patient-controlled analgesia (PCA)** is a method that allows clients to self-administer their own opioids whenever they feel it is necessary. PCA involves an infusion system with a pump. With a PCA pump, the client pushes a button to release a set amount of opioid by bolus via the intravenous, subcutaneous, or epidural route. PCA pumps usually have a chamber or cartridge that contains the analgesic, a mechanism for setting the ordered dose, and a control for client activation. When clients want a dose of analgesic, they can push a button attached to the infusion pump and the preset dose is delivered. A programmable lockout interval (usually 10 to 15 minutes) follows the dose, when an additional dose cannot be given even if the client activates the button. It is also possible to program the maximum dose that can be delivered over a period of hours (usually 4 hours). Many pumps are capable of delivering a low continuous infusion, or basal rate, to provide sustained analgesia during times of rest and sleep. Older children can be taught to use PCAs.

People using PCA tend to take less total analgesia than those receiving intermittent injections (Pasero & McCaffery, 2010). PCA is used for the management of postoperative pain and for other types of acute pain, such as sickle-cell crisis, and for cancer pain. A major advantage to PCA is that it can meet pain relief needs of clients in a more flexible manner compared with conventional analgesic methods (McIntyre, 2001). Whether in an acute care hospital setting, an ambulatory clinic, or home care, the nurse is responsible for the initial instruction regarding the use of the PCA and for the ongoing monitoring of the therapy (see the Teaching: Clinical box). The client's pain must be assessed at regular intervals and analgesic use documented in the client's record. Client concerns about addiction and adverse effects also need to be assessed and addressed. If the PCA pump is used with a child, the nurse must engage in interactive teaching with the child and parents. Additionally, the child's ability to use the PCA client control button must be assessed. Older adults may have more comorbidities and need to be monitored for medication side effects as well as impaired renal and pulmonary functions. Older adults must also be assessed for cognitive and physical ability to push the client control button.

TEACHING **CLINICAL**

Client Self-Management of Pain by Using a Patient-Controlled Analgesia Pump

Choose a time to teach the client about pain management when the pain is controlled so that the client is able to focus on the teaching.

Teaching the client about self-management of pain can include the following:

- Demonstrate the operation of the patient-controlled analgesia (PCA) pump and explain that the client can safely push the button without fear of overmedicating. Sometimes, it helps clients who are reluctant to repeatedly push the button to know that they must dose themselves (i.e., push the button) 5 to 10 times to receive the same amount of medication (10 mg morphine equivalent) they would receive in a standard injection.
- Describe the use of the pain scale and encourage the client to respond to demonstrate understanding.
- Explore a variety of nondrug pain relief techniques that the client is willing to learn and use to promote pain relief and optimize functioning.
- Explain to the client the need to notify staff when ambulation is desired (e.g., for bathroom use), if applicable.

Nonopioid Analgesics

NONSTEROIDAL ANTI-INFLAMMATORY DRUGS

Nonsteroidal anti-inflammatory drugs (NSAIDs), sometimes referred to as nonopioids, include drugs from the following categories: (a) first-generation (COX-1 and COX-2 inhibitors; e.g., Aspirin, ibuprofen, naproxen, ketorolac), and (b) second-generation (COX-2 inhibitors, e.g., celecoxib). These medications have anti-inflammatory, analgesic, and antipyretic effects. They relieve pain mainly by blocking the action of cyclooxygenase (COX, which has two forms: COX-1 and COX-2), the enzyme necessary for the synthesis of prostaglandins that sensitize nerve endings and trigger pain at the periphery (i.e., transduction). The inhibition of COX-1 is responsible for many of the side effects, such as gastric ulceration, bleeding due to platelet inhibition, and acute renal failure. In contrast, the inhibition of COX-2 is responsible for the suppression of pain and inflammation (Lehne, 2009). The use of medication that is a combination of an NSAID and an opioid is indicated for clients with acute musculoskeletal and soft tissue inflammation. Individual drugs in this category vary widely in their analgesic properties, metabolism, excretion, and adverse effects. In addition, the analgesic activity of these drugs has a ceiling effect. Not all clients are candidates for NSAIDs because of side effects. Caution is advised with older adults or clients with renal impairment because of slower clearance rates in these individuals.

The most common adverse effect of NSAIDs is dyspepsia, which can be minimized by taking the medication with food. Stomach ulcers and gastric bleeding have also been reported; those on longer-term NSAID therapy may be prescribed proton-pump inhibitors to preserve the gastric mucosa. NSAIDs may be contraindicated for those with impaired blood clotting, gastrointestinal bleeding or ulcer risk, renal disease, thrombocytopenia (low platelet levels), Aspirin triad (i.e., bronchial asthma, Aspirin intolerance, and rhinitis), and possible infection. Many NSAIDs require a prescription and all have a maximum daily dose limit. Clients and nurses should be aware that dark tarry stools may indicate gastrointestinal bleeding, one of the more dangerous effects of NSAIDs. Depending on the nature of the pain problem, NSAIDs may be prescribed in combination with opioids or coanalgesics. It is also common for an NSAID, such as ibuprofen, to be prescribed together with acetaminophen (Tylenol) to achieve more efficient analgesia.

ACETAMINOPHEN

Acetaminophen (Tylenol) has a different mechanism of action and side effect, or toxicity profile, from that of NSAIDs. It does not affect platelet function and rarely causes gastrointestinal distress, ulcers, or skin or cardiovascular problems. Hepatotoxicity, possibly renal toxicity as well, does occur with higher doses or with long-term use. Generally, 10 g of acetaminophen is considered a lethal dose, with 6 g per day causing measurable liver damage. It is recommended that otherwise young and healthy people limit acetaminophen consumption to less than 4 g/day, with susceptible individuals (e.g., older adults, those with a history of alcoholism, those with liver disease) limiting their consumption to 2.4 g/day or less (Pasero & McCaffery, 2010).

Coanalgesics

A **coanalgesic** agent (formerly known as an *adjuvant*) is a medication that is not classified as a pain medication but that has properties that can reduce pain, alone or in combination with other analgesics; relieve other discomforts; potentiate the effect of pain medications; or reduce the pain medication's side effects. Examples of coanalgesics are antidepressants, anticonvulsants, and others.

Tricyclic antidepressants, such as amitriptyline (Elavil) or nortriptyline (Aventyl), interfere with the reuptake of epinephrine and serotonin in the CNS, leading to reduced pain perception when given in low doses.

Anticonvulsants, such as carbamazepine (Tegretol), stabilize nerve membranes, reducing excitability and spontaneous firing. Gabapentin (Neurontin) and pregabaline (Lyrica) are thought to modulate the electrical activity of the brain by modulating the release of excitatory neurotransmitters (Pasero & McCaffery, 2010). These agents appear to be particularly beneficial in the management of neuropathic pain. Anxiolytics, sedatives, and antispasmodics are examples of medicines that relieve other discomforts but do not alleviate pain and thus should be used in addition to, rather than instead of, analgesics. Examples of medications used to reduce the side effects of analgesics include stimulants, laxatives, and antiemetics.

Placebo Response

The **placebo response** occurs when people experience pain relief from an intervention that may not be directly related to the actual pain relief method employed. Health care professionals can cause a positive placebo response by the ways they interact with clients. The nurse's empathic approach toward the client, such as listening without judgment, giving opportunities to express pain and permission to do so, and recognizing the person's unique responses, help to facilitate pain relief. Medication placebos, such as giving a saline injection instead of an opioid, are unethical.

Nonpharmacological Pain Management

Nonpharmacological pain management consists of a variety of physical, cognitive–behavioural, and lifestyle pain management strategies that target the body, mind, spirit, and social interactions (Table 30.9). Physical

TABLE 30.9 Nonpharmacological Interventions for Pain Control

Target Domain of Pain Control	Intervention	Pain Pathway Implicated
Body	Reducing pain triggers, promoting comfort Massage Applying heat or ice Electric stimulation (TENS) Positioning, bracing (selective immobilization) Acupressure Invasive interventions (e.g., blocks) Sleep hygiene Diet, nutritional supplements, exercise	May involve various pain pathways Perception (see GCT) Transmission, transduction, perception Perception, ascending modulation Transduction, transmission Ascending modulation, perception Transmissions and other processes Perception and modulation May involve multiple pain pathways
Mind	Relaxation, imagery Self-hypnosis Distracting attention Pain diary, journal writing Repatterning thinking Attitude adjustment Reducing fear, anxiety, stress Reducing sadness, helplessness Information about pain	*Mind* activities primarily involve perception and modulation
Spirit	Prayer, meditation Self-reflection about life and pain Meaningful rituals Energy work (e.g., therapeutic touch, reiki) Spiritual healing Functional restoration	*Spirit* pain intervention domains involve perception and modulation but may evolve to implicate other pain pathways
Social Interactions	Improved communication Family therapy Problem solving Vocational training Volunteering Support groups	May implicate various pain pathways

modalities include cutaneous stimulation, immobilization or therapeutic exercises, transcutaneous electrical nerve stimulation (TENS), and acupuncture. Mind–body (cognitive–behavioural) interventions include distracting activities, relaxation techniques, imagery, meditation, biofeedback, hypnosis, cognitive reframing, emotional counselling, and spiritually directed approaches, such as therapeutic touch or reiki. Lifestyle management approaches include symptom monitoring, stress management, exercise, nutrition, pacing activities, disability management, and other approaches needed by many clients with persistent pain that has effected a drastic change in their lives. Further information on selected mind–body interventions are detailed in Chapter 16. The discussion here is limited to selected physical and cognitive–behavioural interventions.

Physical Interventions

The goals of physical intervention include providing comfort, altering physiological responses to reduce pain perception, and optimizing functioning.

CUTANEOUS STIMULATION Cutaneous stimulation can provide effective temporary pain relief. It distracts the client and focuses attention on the tactile stimuli, away from the painful sensations, thus reducing pain perception. Cutaneous stimulation is also believed to create the release of endorphins that block pain stimuli transmission and stimulate large-diameter A-beta sensory nerve fibres, thus decreasing the transmission of pain impulses through the smaller A-delta and C fibres. Cutaneous stimulation techniques include the following:

- Massage
- Application of heat or cold
- Acupressure
- Contralateral stimulation

Cutaneous stimulation can be applied directly to the painful area, proximal to the pain, distal to the pain (along the nerve path or dermatome), and contralateral (exact location, opposite side of the body) to the pain. Cutaneous stimulation is contraindicated in areas of skin breakdown and for those clients with impaired neurological functioning.

Massage Massage is a comfort measure that can aid relaxation and decrease muscle tension as well as ease anxiety as the physical contact communicates caring. Massage can also decrease pain intensity by increasing superficial circulation to the area. Massage can involve the back and neck, hands and arms, or feet (see Chapter 38 for a discussion on back massage).

Heat and Cold Applications A warm bath, warm pads, ice bags, ice massage, warm or cold compresses, and warm or cold sitz baths, in general, relieve pain and promote healing of injured tissues (see Chapter 35). These are modalities of pain management that are not time consuming and are easily obtained in any setting; they should not be overlooked by clinicians as a complementary strategy for the standard pain management techniques. Application of heat should, however, be used with caution, especially in the emergency department setting.

Acupressure Acupressure developed from the ancient Chinese healing system of acupuncture. The therapist applies finger pressure to points that correspond to many of the points used in acupuncture (see Chapter 16).

Contralateral Stimulation Contralateral stimulation can be accomplished by stimulating the skin in an area opposite to the painful area (e.g., stimulating the left knee if the pain is in the right knee). The contralateral area may be scratched for itching, massaged for cramps, if appropriate, or treated with cold packs or analgesic ointments. This method is particularly useful when the painful area cannot be touched because it is hypersensitive, when it is inaccessible by a cast or bandages, or when the pain is felt in a missing part (phantom pain).

IMMOBILIZATION AND BRACING Immobilizing or restricting the movement of a painful body part (e.g., arthritic joint, traumatized limb) may help to manage episodes of acute pain. Splints or supportive devices should hold joints in the position of optimal function and should be removed regularly in accordance with agency protocol to provide range-of-motion (ROM) exercises, if not contraindicated. Prolonged immobilization can result in joint contracture, muscle atrophy, and cardiovascular problems. Therefore, clients should be encouraged to participate in self-care activities and remain as active as possible, with frequent ROM exercises.

TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION **Transcutaneous electrical nerve stimulation (TENS)** is a method of applying low-voltage electrical stimulation directly over identified pain areas, at an acupressure point, along peripheral nerve areas that innervate the pain area, or along the spinal column. The TENS unit consists of a portable, battery-operated device with lead wire and electrode pads that are applied to the chosen area of skin. Cutaneous stimulation from the TENS unit is thought to activate large-diameter fibres that modulate the transmission of the nociceptive impulse in the peripheral nervous system and CNS (closing the pain gate), resulting in pain relief. This stimulation may also cause a release of endorphins from the CNS centres.

ACUPUNCTURE Acupuncture, a form of traditional Chinese medicine, involves the insertion of thin sterile needles into specific points of the skin with the goal of relieving pain (see Chapter 16).

Cognitive–Behavioural Interventions

The goals of cognitive–behavioural interventions include providing comfort, altering psychological responses to reduce pain perception, and optimizing functioning. Selected cognitive–behavioural interventions include distraction, elicitation of the relaxation response, and psychoeducation.

DISTRACTION Distraction draws the person's attention away from the pain and lessens the perception of pain. In some instances, distraction can make a client completely unaware of pain. For example, a client recovering from surgery may feel no pain while watching a football game on television, yet feel pain again when the game is over. Different types of distraction include visual distraction (reading or watching TV, guided imagery), auditory distraction (listening to music, humour), tactile distraction (slow rhythmic breathing, massage, holding and stroking a pet or a toy), and intellectual distraction (playing table or card games, doing a puzzle, hobbies).

ELICITATION OF THE RELAXATION RESPONSE Stress increases pain, in part by increasing muscle tension, activating the sympathetic nervous system, and putting the client at risk for stress-related types of pain (e.g., tension headaches). The relaxation response decreases and counteracts the harmful effects of stress, including the effect it has on physical, cognitive, and emotional functioning. Eliciting this response requires more than simply helping a person to relax; rather, it involves a structured technique designed to focus the mind and relax muscle groups. Basic techniques with helpful scripts are detailed by Pasero and McCaffery (2010), with common techniques including progressive relaxation, breath-focus relaxation, and meditation. The nurse can coach the client, urge self-directed meditation, or provide an audiotaped guide to help elicit the relaxation response. Many clients can achieve the desired state after a few attempts, but mastery of this skill requires daily practice over a few weeks. In general, relaxation techniques by themselves do not have remarkable pain-relieving properties; however, they can reduce pain that may have been exacerbated by stress. Some clients may become more consciously aware of their pain while practising relaxation techniques before they have mastered controlling mind chatter and remaining mentally focused.

PSYCHOEDUCATION Once the client has mastered the basic skills for eliciting the relaxation response, techniques of imagery or self-hypnosis can be considered. Both imagery and hypnosis begin with attaining a deep state of relaxation and are capable of altering the experience of pain, for example, by having the client replace their pain with a feeling of pleasant

LIFESPAN CONSIDERATIONS

Pain Management

INFANTS

- Giving an infant, particularly a very low-birth-weight infant, a water and sucrose solution administered through a pacifier provides some evidence of pain reduction during procedures that may be painful, but it should not be a substitute for anesthetic or analgesic medications.

CHILDREN

- Distract the child with toys, books, or pictures.
- Hold the child to console him or her and provide comfort.
- Explore misbeliefs about pain and correct them in understandable concrete terms. Be aware of how your explanations may be misunderstood. For example, telling a child that surgery will not hurt because he or she will be "put to sleep" will be very upsetting to a child who knows of an animal that was "put to sleep."
- Children can use their imagination during guided imagery. To use the pain switch, ask the child to imagine a pain switch (even give it a colour) and tell him or her to visualize turning the switch off in the area where he or she has pain. A "magic glove" or "magic blanket" is an imaginary object that the child applies on areas of the body (e.g., hand, thigh, back, hip) to lessen discomfort.

OLDER ADULTS

- Promote the client's use of pain-control measures that have worked in the past.
- Spend time with the client, and listen carefully.
- Clarify misbeliefs. Encourage independence, whenever possible.
- Carefully review the treatment plan to avoid drug–drug, food–drug, or disease–drug interactions.

If desired health outcomes are *not* achieved, the nurse and the client need to explore the reasons before modifying the care plan. The following are some questions the nurse might consider:

- Is adequate analgesic being given? Would the client benefit from a change in dose or in the time interval between doses?
- Were the client's beliefs and values about pain therapy considered?
- Did the client understate the pain experience for some reason?
- Were appropriate instructions provided to allay misbeliefs about pain management?
- Did the client and support people understand the instructions about pain management techniques?
- Is the client receiving adequate support from his or her significant others?
- Has the client's physical condition changed, necessitating modifications in interventions?
- Should selected intervention strategies be re-evaluated?

numbness (Arnstein, 2004). Additional posthypnotic suggestions can then be made, linking these pleasant numb sensations to coping efforts used during the day (e.g., "Every time you stop to take a slow, deep, diaphragmatic breath, you will feel this pleasant numbness instead of pain").

Psychoeducation is increasingly being used as an adjunctive means of managing the impact of chronic pain on health-related quality of life and disability (McGillion, Watt-Watson, Kim, & Yamada, 2004; McGillion et al., 2007). Psychoeducational interventions are group self-management education programs delivered by a trained facilitator; clients can be accompanied by family members or friends if they want. The focus is to provide participants with an opportunity to enhance their skills for self-care. Through rehearsal and application of various cognitive and behavioural self-management techniques, participants learn to set realistic self-management goals in relation to their chronic pain. The goal-setting process allows for the self-attribution of success thereby improving perceived self-efficacy in managing symptoms. Nurses facilitating psychoeducation programs require expertise in psychoeducational techniques, group process, and assessment of participants' readiness to engage in self-management.

See the Lifespan Considerations box for age-specific ways to manage pain.

Evaluating

By using the desired outcomes established during the planning stage as a guide, the nurse and the client determine whether client goals and outcomes have been achieved. Examples of client goals and related outcomes are shown in Table 30.10.

To assist in the evaluation process, a flowsheet or a client diary may be helpful. Columns for day, time, onset of pain, activity before pain, pain-relief measure, and duration of pain can be devised to help the client and nurse determine the effectiveness of pain-relief strategies.

TABLE 30.10 Evaluation Goals and Outcomes: Pain

Goal	Examples of Desired Health Outcomes
Modify or minimize pain to enable partial or complete resumption of daily activities	Reports pain relief at level of (specify) or less, on a scale of 0 to 10; or expresses feelings of reasonable comfort Reports decreased frequency and length of pain episodes or decreased fear and anxiety Absence of nonverbal pain responses, such as restlessness, muscle tension, protective body position, facial grimacing (specify) Reports increase in mobility and physical activity, in hours of uninterrupted sleep at night, and in quality of life
Enhance abilities to control pain	Identifies factors that precipitate or intensify the pain experience Identifies both pharmacological and nonpharmacological pain management techniques Identifies ways to prevent side effects of drugs
Demonstrate actions to control pain and associated symptoms	Reduces or eliminates factors that precipitate or intensify the pain experience Uses a pain diary to monitor pain pattern and effectiveness of pain measures Uses planned nonpharmacological pain relief measures (specify) Uses analgesics appropriately

Case Study 30

Mrs. Lundahl, 45 years old, underwent an emergency anterior bowel resection approximately 6 hours ago. She has a 15-cm midline incision that is covered with a dry and intact surgical dressing. On assessing Mrs. Lundahl, you note that she is perspiring, lying in a rigid position, holding her abdomen, and grimacing. Her blood pressure is 150/90; heart rate, 100; and respiratory rate, 32. She rates her pain as 8 on a scale of 0 to 10.

(continued)

CRITICAL THINKING QUESTIONS

1. What conclusions, if any, can be drawn about Mrs. Lundahl's pain status?
2. What type of pain is Mrs. Lundahl experiencing?
3. What interventions, in addition to pain medication, may be useful in reducing Mrs. Lundahl's pain?
4. How will you know if your interventions have been effective in reducing Mrs. Lundahl's pain?

After working through these questions, go to the MyNursingLab at **www.mynursinglab.com** to check your answers.

KEY TERMS

acute pain *p. 742*
addiction *p. 765*
agonist–antagonist analgesic *p. 762*
allodynia *p. 741*
ceiling dose *p. 762*
ceiling effect *p. 762*
central disinhibition *p. 742*
central neuropathic pain *p. 742*
central sensitization *p. 746*
chronic pain *p. 742*
coanalgesic *p. 769*
complex regional pain syndrome *p. 742*
equianalgesia *p. 765*
equianalgesic dose *p. 765*
full agonist *p. 762*
hyperalgesia *p. 741*
hyperexcitability *p. 741*
modulation *p. 745*
nervous system plasticity *p. 746*
neuropathic pain *p. 740*
neuroplasticity *p. 741*
nociception *p. 743*
nociceptive pain *p. 740*
nociceptors *p. 740*
nonsteroidal anti-inflammatory drug (NSAID) *p. 769*
pain *p. 738*
pain management *p. 760*
pain threshold *p. 743*
pain tolerance *p. 743*
partial agonist *p. 762*
patient-controlled analgesia (PCA) *p. 768*
perception *p. 745*
peripheral neuropathic pain *p. 741*
peripheral sensitization *p. 746*
physical dependence *p. 765*
placebo response *p. 770*
preemptive analgesia *p. 761*
referred pain *p. 751*
sensitization *p. 746*
somatic pain *p. 740*
tolerance *p. 763*
transcutaneous electrical nerve stimulation (TENS) *p. 771*
transduction *p. 744*
transmission *p. 744*
visceral pain *p. 740*
wind-up *p. 746*

CHAPTER HIGHLIGHTS

- Pain is a subjective, multidimensional experience with sensory–discriminative, cognitive–evaluative, and motivational–affective components; many clients need encouragement or help to communicate their pain experience, particularly with respect to its intensity, duration, qualities, and related individual responses.
- Unrelieved pain has multiple serious consequences and can prolong recovery from surgery, disease, and trauma.
- Pain can be categorized according to its origin (e.g., somatic, visceral, neuropathic) or according to its duration (e.g., acute pain, chronic pain).
- Pain threshold is relatively similar in all people and changes little in the same individual over time; conversely, pain tolerance and response vary considerably from person to person *and* in the same person at different times and in different circumstances.
- For pain to be experienced, primary afferent nociceptors must be stimulated. Three types of pain stimuli are mechanical, thermal, and chemical.
- The pain process is complex and involves transduction, transmission, perception, and modulation.
- Endogenous opioids, critical to pain modulation, include enkephalins, endorphins, and dynorphins.
- Gate control theory is the basis of many pain-intervention strategies and explains the multi-dimensional nature of pain; yet, it is a theory of acute pain, and it cannot account for nervous system plasticity.
- Numerous factors influence a person's perception and reaction to pain: ethnic and cultural values, developmental stage, environment and support people, past pain experiences, and meaning of pain.

- Pain is subjective, and the most reliable indicator of the presence or intensity of pain is the client's self-report. Assessment of a client who is experiencing pain should include a comprehensive pain history. Clients who cannot self-report (e.g., comatose clients) require specialized assessment techniques.
- Multiple nursing diagnoses related to pain can be formulated; many also relate to the consequences of the pain experience (e.g., social isolation).
- Overall client goals include preventing, modifying, or eliminating pain so that the client is able to partially or completely resume usual daily activities and to cope more effectively with the pain experience.
- When planning, nurses need to choose pain-relief measures appropriate for the client. Nursing interventions should include a variety of pharmacological and nonpharmacological interventions. Selecting several strategies from both broad categories is usually most effective.
- Scheduling the measures to *prevent* pain is far more supportive of the client than trying to deal with pain once it is established.
- Pain management includes two basic types of nursing interventions: pharmacological and nonpharmacological.
- Major nursing functions for all clients are to acknowledge and convey belief in the client's pain, assist support people, reduce misbeliefs about pain, and reduce fear and anxiety associated with the pain.
- Pharmacological interventions include the use of opioids, nonopioids or NSAIDs, and coanalgesics.
- The nurse assesses the client's pain needs, administers the prescribed analgesics, and evaluates the client's response to analgesics provided.
- Analgesic medication can be delivered through a variety of routes and methods to meet the specific needs of the client. These routes include oral, subcutaneous with a continuous infusion, intravenous, transnasal, transdermal or topical, rectal, and intraspinal.
- Patient-controlled analgesia (PCA) enables the client to exercise control and minimize feelings of helplessness.
- Nonpharmacological pain interventions include cutaneous stimulation, such as warm and cold applications, massage, acupressure, and contralateral stimulation; transcutaneous electrical nerve stimulation (TENS); and immobilization or bracing.
- Examples of cognitive–behavioural interventions include distraction techniques and psychoeducation.
- Evaluation of the client's pain therapy includes the response of the client, the changes in the pain, and the client's perceptions of the effectiveness of the therapy. Ongoing verbal or written feedback from the client and family is integral to this process.

ASSESS YOUR LEARNING

1. When an excited nociceptor converts a noxious stimulus into an action potential, this is referred to as which of the following?
   - **a.** Modulation
   - **b.** Perception
   - **c.** Transduction
   - **d.** Transmission
2. Which of the following is the definition of the placebo response?
   - **a.** The person's pain is not real.
   - **b.** Inflammation has subsided.
   - **c.** Endogenous opioids have been released.
   - **d.** The client has failed to respond to opioids.
3. Which of the following will the nurse perform to check for the presence of the most common adverse effect of opioids?
   - **a.** A respiratory assessment
   - **b.** A bladder scan or palpation
   - **c.** An assessment of the level of pruritus
   - **d.** An assessment of the client's bowel function
4. A client admitted for treatment of unmanaged chronic pain is prescribed morphine and nortriptyline, an antidepressant. The client states, "I'm here for pain, not depression! Give me the morphine but I refuse the other pill!" The nurse responds with which of the following statements about the antidepressant?
   - **a.** "This pill is meant to prevent you from getting depressed because of the pain you have been experiencing."
   - **b.** "This pill will help reduce any inflammation that you might have."
   - **c.** "This pill will help your nervous system by increasing your body's own pain-reducing substances."
   - **d.** "This pill helps to block the pain signals from going up your spinal cord."
5. A patient recovering from a surgical intervention requires increasing doses of analgesia in the postoperative period to control pain. Of the following possibilities, which is the most likely hypothesis to explain this pattern?
   - **a.** Tolerance to the analgesia has occurred.
   - **b.** Dependence on the analgesia has occurred.

c. Addiction to the analgesia has occurred.

d. Compulsive drug abuse has been established.

6. The patient is prescribed morphine 2.5 mg to 5.0 mg IV every 4 hours. He received 2.5 mg IV 4 hours ago for pain rated at 3 on a scale of 0 to 10. He is now watching TV and visiting with family members. When asked about his pain, he rates it as a 5. His vital signs (VS) are stable. What nursing intervention is the MOST appropriate?

a. Give morphine 3.5 mg IV and inform him to continue watching TV because it is a distraction from the pain

b. Give 2.5 mg of morphine IV to avoid the client becoming addicted

c. Give nothing at this time because he is not exhibiting any signs of pain

d. Give morphine 5.0 mg IV and reassess in 20 minutes

7. During an admission nursing assessment, a client with diabetes describes his leg pain as a "dull, burning sensation." The nurse recognizes this description as characteristic of which type of pain?

a. Referred

b. Somatic

c. Visceral

d. Neuropathic

8. Which of the following is the need to continue the use of an opioid to prevent the symptoms of withdrawal?

a. A psychological response

b. A physiological response

c. A threshold response

d. An addictive response

9. Ms. Aitken, 45 years old, has acute pain following a fractured ankle. The physician's order is acetaminophen (Tylenol #3) 30 mg of codeine one to two tablets, q3–4h prn. Although the last dose was given 1 hour ago, she reports severe pain. What nursing action is most appropriate?

a. Consult the nurse-in-charge

b. Reassess Ms. Aitken's pain in 15 minutes

c. Notify the physician of Ms. Aitken's pain level

d. Administer an additional dose while awaiting a new order

10. A client who has been receiving 100 mg IV morphine per day is now being prescribed oral hydromorphone (Dilaudid). The equianalgesia chart indicates that 10 mg IV morphine is equivalent to 7.5 mg hydromorphone. How many milligrams of hydromorphone will this client receive daily that is equivalent to the IV dosage of morphine?

a. 0.75 mg oral hydromorphone (Dilaudid) per day

b. 7.5 mg oral hydromorphone (Dilaudid) per day

c. 75 mg oral hydromorphone (Dilaudid) per day

d. 750 mg oral hydromorphone (Dilaudid) per day

After working through these questions, go to the MyNursingLab at **www.mynursinglab.com** *to check your answers and see explanations.*

WEBLINKS

The Canadian Pain Society

http://www.canadianpainsociety.ca

The Canadian Pain Society is a chapter of the International Association for the Study of Pain. The site provides information on research opportunities, conferences, interest groups, and news about pain practices.

International Association for the Study of Pain

http://www.iasp-pain.org

This association is the largest multidisciplinary nonprofit international association in the field of pain. Its goal is to advance research on pain and improve the care of clients with pain. The site provides an overview of the association and its activities, as well as links to publications and continuing education initiatives.

Institute for the Study and Treatment of Pain

http://www.istop.org

This is a Canadian nonprofit society dedicated to research, treatment, training, and education in chronic pain. Information about the society and treatment options for people with chronic pain is available at this site.

Canadian Pain Coalition

http://www.canadianpaincoalition.ca

The Canadian Pain Coalition is "a partnership of patient pain groups, health professionals who care for people in pain, and scientists studying better ways of treating pain."

Chronic Pain Association of Canada

http://www.chronicpaincanada.com

The Chronic Pain Association of Canada is a nonprofit group that focuses on treatments and the management of chronic intractable pain.

REFERENCES

Adler, J. E., Nico, L., VandeVord, P., & Skoff, A. M. (2009). Modulation of neuropathic pain by a glial-derived factor. *Pain Medicine, 10*(7), 1229–1236. doi: 10.1111/j.1526-4637.2009.00708.x

American Academy of Pain Medicine, American Pain Society, & American Society of Addiction Medicine. (2001). Definitions related to the use of opioids for the treatment of pain: A consensus document from the American Academy of Pain Medicine, the American Pain Society, and the American Society of Addiction Medicine. Retrieved from http://www.painmed.org/Workarea/DownloadAsset.aspx?id=3204

American Educational Research Association, American Psychological Association, & National Council on Measurment in Education. (1999). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

American Geriatric Society. (2002). The management of persistent pain in older persons. *Journal of the American Geriatric Society, 50,* S205–S224.

Anand, K. J. S., & Craig, K. D. (1996). New perspectives on the definition of pain. *Pain, 67,* 3–6.

American Pain Society. (1999). *Principles of analgesic use in treatment of acute pain and cancer pain* (4th ed.). Glenview, IL: American Pain Society.

Argoff, C. E., Albrecht, P., Irving, G., & Rice, F. (2009). Multimodal analgesia for chronic pain: Rationale and future directions. *Pain Medicine, 10*(S2), S53–S66. doi: 10.1111/j.1526-4637.2009.00669.x

Arnstein, P. M. (2004). Chronic neuropathic pain: Issues in patient education. *Pain Management Nursing, 5*(4), 34–41.

Arntz, A., & Claassens, L. (2004). The meaning of pain influences its experienced intensity. *Pain, 109*(1–2), 20–25. doi: 10.1016/j.pain.2003.12.030

Ashley, E., & Given, J. (2008). Pain management in the critically ill. *Critical Illness, 18*(11), 504–509. ISSN 1467-1026.

Ballantyne, M., Stevens, B., McAllister, M., Dionne, K., & Jack, A. (1999). Validation of the premature infant pain profile in the clinical setting. *Clinical Journal of Pain, 15*(4), 297–303.

Bartocci, M., Bergqvist, L. L., Lagercrantz, H., & Anand, K. J. S. (2006). Pain activates cortical areas in the preterm newborn brain. *Pain, 122*(1-2), 109–117. doi: 10.1016/j.pain.2006.01.015

Basbaum, A., & Bushnell, M. C. (2002). Pain: Basic mechanisms. In Giamberardino, M. A. (Ed.), *Pain 2002, An updated review: Refresher course and syllabus* (pp. 3–9). Seattle, WA: IASP Press.

Basbaum, A., & Jessell, T. (2000). The perception of pain. In Kandel, E. R., Schwartz, J. H., & Jessell, T. (Eds.). *Principles of neural science* (4th ed.). NewYork, NY: McGraw-Hill, Health Professions Division.

Bennett, M. (2001). The LANSS Pain Scale: the Leeds assessment of neuropathic symptoms and signs. [Clinical Trial Validation Studies]. *Pain, 92*(1-2), 147–157.

Boly, M., Faymonville, M. E., Schnakers, C., Peigneux, P., Lambermont, B., Phillips, C., . . . Laureys, S. (2008). Perception of pain in the minimally conscious state with PET activation: An observational study. *Lancet Neurology, 7*(11), 1013–1020.

Bonica, J. J. (1990). *The management of pain.* Philadelphia, PA: Lea & Febiger.

Campbell, J. N., & Meyer, R. A. (2006). Mechanisms of neuropathic pain. *Neuron, 52*(1), 77–92.

Canadian Nurses Association. (2008). Code of Ethics for Registered Nurses, Centennial Edition. *Nursing values and ethical responsibilities.* Ottawa, ON: Canadian Nurses Association.

Canadian Pain Society. (2005). *Accreditation pain standard: Making it happen!* Retrieved from http://www.canadianpainsociety.ca/accreditation_manual.pdf

Caterina, M. J., Gold, M. S., & Meyer, R. A. (2005). Molecular biology of nociceptors. In Hunt, S. & Koltzenburg, M. (Eds.). *The neurobiology of pain* (pp. 1–5). Oxford, NY: Oxford University Press.

Champion, G. D., Goodenough, B., von Baeyer, C. L., & Thomas, W. (1998). Measurement of pain by self-report. In Finley, G. A. & McGrath, P. J. (Eds.). *Measurement of pain in infants and children. Progress in pain research and management* (Vol. 10) (pp. 123–160). Seattle, WA: IASP Press.

Charlton, J. E. (2005). *Core curriculum for professional education in pain.* Seattle, WA: IASP Press.

Cleeland, C. S., & Ryan, K. M. (1994). Pain assessment: Global use of the Brief Pain Inventory. [Review]. *Annals of the Academy of Medicine Singapore, 23*(2), 129–138.

Cleeland, C. S., Serlin, R., Nakamura, Y., & Mendoza, T. (1997). Effects of culture and language on ratings of cancer pain and patterns of functional interference. In Jensen, T. S., Turner, J. A. & Wiesenfeld-Hallin, Z. (Eds.). *Progress in Pain Research and Management* (Vol. 8). Seattle, WA: IASP Press.

Coderre, T. J., Katz, J., Vaccarino, A. L., & Melzack, R. (1993). Contribution of central neuroplasticity to pathological pain: Review of clinical and experimental evidence. *Pain, 52*(3), 259–285. doi: 10.1016/0304-3959(93)90161-h

Cohen, L. L., Lemanek, K., Blount, R. L., Dahlquist, L. M., Lim, C. S., Palermo, T. M., . . . Weiss, K. E. (2008). Evidence-based assessment of pediatric pain. *Journal of Pediatric Psychology, 33*(9), 939–955. doi: 10.1093/jpepsy/jsm103

Craig, A. D., & Sorkin, L. S. (2011, March). Pain and analgesia. In *Encyclopedia of Life Sciences (ELS).* Chichester, UK: John Wiley & Sons, Ltd. doi: 10.1002/9780470015902.a0000275.pub3

Dahl, J. B. (2000, November 2–5). *Implementing the JCAHO pain management standards.* Paper presented at the American Pain Society 19th Annual Meeting, Atlanta, GA.

Dahl, J. B., & Moiniche, S. (2004). Pre-emptive analgesia. *British Medical Bulletin, 71*(1), 13–27. doi: 10.1093/bmb/ldh030

Dahl, J. L., Gordon, D., Ward, S., Skemp, M., Wochos, S., & Schurr, M. (2003). Institutionalizing pain management: The post-operative pain management quality improvement project. *Journal of Pain, 4,* 361–371.

Daniel, K. & Schmelzer, M. (2009). Research in practice: Why are we still using meperidine (Demerol) for conscious sedation? *Gastroenterology Nursing, 32*(4), 298–301.

Dobbins, E. H. (2010). Where has all the meperidine gone? *Nursing, 40*(1), 65–66.

Dunwoody, C. J., Krenzischek, D. A., Pasero, C., Rathmell, J. P., & Polomano, R. C. (2008). Assessment, physiological monitoring, and consequences of inadequately treated acute pain. *Journal of Perianesthesia Nursing: Official journal of the American Society of PeriAnesthesia Nurses / American Society of PeriAnesthesia Nurses, 23*(1), S15–S27.

DuPen, A., Shen, D., & Ersek, M. (2007). Mechanisms of opioid-induced tolerance and hyperalgesia. *Pain Management Nursing, 8*(3), 113–121.

Dworkin, R. H., Gnann, J. W., Oaklander, A. L., Raja, S. N., Schmader, K. E., & Whitley, R. J. (2008). Diagnosis and assessment of pain associated with herpes zoster and postherpetic neuralgia. *The Journal of Pain: Official Journal of the American Pain Society, 9*(1), 37–44.

Ellis, J. A., O'Connor, B. V., Cappelli, M., Goodman, J. T., Blouin, R., & Reid, C. W. (2002). Pain in hospitalized pediatric patients: How are we doing? *The Clinical Journal of Pain, 18*(4), 262–269.

Feldt, K. S. (2000). The checklist of nonverbal pain indicators (CNPI). *Pain Management Nursing, 1*(1), 13–21. doi: 10.1053/jpmn.2000.5831

Fernandes, M., da Costa, V., & Saraiva, R. A. (2007). Postoperative urinary retention: Evaluation of patients using opioid analgesics. *Revista Latino-Americana Enfermagem, 15*(2), 318–322.

Fuchs-Lacelle, S., & Hadjistavropoulos, T. (2004). Development and preliminary validation of the pain assessment checklist for seniors with limited ability to communicate (PACSLAC). *Pain Management Nursing, 5*(1), 37–49. doi: 10.1016/j.pmn.2003.10.001

Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: Scientific advances and future directions. *Psychology Bulletin, 133*(4), 581–624. doi: 10.1037/0033-2909.133.4.581

Gelinas, C. (2007). Le thermomètre d'intensité de douleur: Un nouvel outil pour les patients adultes en soins critiques. *Perspective infirmière, 4*(4), 12–20.

Gelinas, C. & Arbour, C. (2009). Behavioral and physiologic indicators during a nociceptive procedure in conscious and unconscious mechanically ventilated adults: Similar or different? *Journal of Critical Care, 24*(4), 628.e7–e17. Epub 2009 Mar 27.

Gelinas, C. & Johnston, C., (2007). Pain assessment in the critically ill ventilated adult: Validation of the Critical-Care Pain Observation Tool and physiologic indicators. *Clinical Journal of Pain,* 23(6), 497–505.

Gibbs, G. F., Drummond, P. D., Finch, P. M., & Phillips, J. K. (2008). Unravelling the pathophysiology of complex regional pain syndrome: Focus on sympathetically maintained pain. *Clinical and Experimental Pharmacology and Physiology, 35*(7), 717–724. doi: 10.1111/j.1440-1681.2007.04862.x

Gibson, S. J., & Farrell, M. (2004). A review of age differences in the neurophysiology of nociception and the perceptual experience of pain. *The Clinical Journal of Pain, 20*(4), 227–239.

Gibson, S. J., & Helme, R. D. (2001). Age-related differences in pain perception and report. *Clinics in Geriatric Medicine, 17,* 433–456.

Goadsby, P. J., Lipton, R. B., & Ferrari, M. D. (2002). Migraine—current understanding and treatment. *New England Journal of Medicine, 346*(4), 257–270.

Gordon, C. (1997). The effect of cancer pain on quality of life in different ethnic groups: A literature review. [Review]. *Nurse Practice Forum, 8*(1), 5–13.

Grunau, R. E., Holsti, L., Haley, D. W., Oberlander, T., Weinberg, J., Solimano, A., Whitfield, M. F., Fitzgerald, C., Yu, W. (2005). Neonatal procedural pain exposure predicts lower cortisol and behavioral reactivity in preterm infants in the NICU. *Pain, 113*(3), 293–300.

Hadjistavropoulos, T., & Craig, K. D. (2002). A theoretical framework for understanding self-report and observational measures of pain: A communications model. *Behaviour Research and Therapy, 40*(5), 551–570. doi: 10.1016/s0005-7967(01)00072-9

Hadjistavropoulos, T., Herr, K., Turk, D. C., Fine, P. G., Dworkin, R. H., Helme, R., . . . Williams, J. (2007). An interdisciplinary expert consensus statement on assessment of pain in older persons. *The Clinical Journal of Pain, 23,* S1–S43. doi: 10.1097/AJP.1090b1013e31802be31869

Hall, R. W., & Anand, K. J. S. (2005). Physiology of pain and stress in the newborn. *Neoreviews, 6*(2), e61–e68. doi: 10.1542/neo.6-2-e61

Harden, R. N., Bruehl, S., Stanton-Hicks, M., & Wilson, P. R. (2007). Proposed new diagnostic criteria for complex regional pain syndrome. *Pain Medicine, 8*(4), 326–331. doi: 10.1111/j.1526-4637.2006.00169.x

Herr, K. (2002). Chronic pain: Challenges and assessment strategies. *Journal of Gerontologocal Nursing, 28*(1), 54–55.

Herr, K., & Mobily, P. R. (1993). Comparison of selected pain assessment tools to be used with the elderly. *Applied Nursing Research, 6*(1), 39–46.

Herr, K., Coyne, P. J., Manworren, R., McCaffery, M., Merkel, S., Pelosi-Kelly, J., & Wild, L. (2006). Pain assessment in the nonverbal patient: Position statement with clinical practice recommendations. *Pain Management Nursing, 7*(2), 44–52.

Herrero, J. F., Laird, J. M. A., & Lopez-Garcia, J. A. (2000). Wind-up of spinal cord neurons and pain sensation: Much ado about something? *Progress in Neurobiology, 61*(2), 169–203. doi: 10.1016/s0301-0082(99)00051-9

Hicks, C. L., von Baeyer, C. L., Spafford, P. A., van Korlaar, I., & Goodenough, B. (2001). The Faces Pain Scale—Revised: Toward a common metric in pediatric pain measurement. *Pain, 93*(2), 173–183. doi: 10.1016/s0304-3959(01)00314-1

Huskisson, E. C. (1983). Visual analogue scales. In Melzack, R. (Ed.). *Pain measurement and assessment* (pp. 33–37). New York, NY: Raven Press.

International Association for the Study of Pain. (1979). Pain terms: A list with definitions and notes on usage. *Pain, 6,* 249–252.

International Association for the Study of Pain. (2001). Ethnicity and pain. *Pain Clinical Updates, 9*(4).

International Association for the Study of Pain. (2011). IASP Taxonomy. Retrieved from http://www.iasp-pain.org/Content/NavigationMenu/GeneralResourceLinks/PainDefinitions/default.htm

Jamison, R. N., & Virts, K. L. (1990). The influence of family support on chronic pain. *Behaviour Research and Therapy, 28*(4), 283–287. doi: 10.1016/0005-7967(90)90079-x

Jensen, M. P., & Karoly, P. (1986). The measurement of clinical pain intensity: A comparison of six methods. *Pain, 27*(1), 117–126.

Jensen, M. P., & Karoly, P. (2001). Self-report scales and procedures for assessing pain in adults. In Turk, D. C. & Melzack, R. (Eds.). *Handbook of pain assessment.* New York, NY: Gilfrod Press.

Joshi, G. P., & Ogunnaike, B. O. (2005). Consequences of inadequate postoperative pain relief and chronic persistent

postoperative pain. *Anesthesiology Clinics of North America, 23*(1), 21–36.
Jung, A. C., Staiger, T., & Sullivan, M. (1997). The efficacy of selective serotonin reuptake inhibitors for the management of chronic pain. *Journal of General Internal Medicine, 12*(6), 384–389. doi: 10.1007/s11606-006-5088-3
Kaki, A. M., El-Yaski, A. Z., & Youseif, E. (2005). Identifying neuropathic pain among patients with chronic low-back pain: Use of the Leeds Assessment of Neuropathic Symptoms and Signs pain scale. *Regional Anesthesia and Pain Medicine, 30*(5), 422–428. doi: 10.1016/j.rapm.2005.05.013
Kane, R. L., Ouslander, J. G., & Itamar, B. A. (2004). Clinical implications of the ageing process. *Essentials of Clinical Geriatrics* (5th ed.) (pp. 3–15). Highstown, NJ: McGraw Hill.
Katz, J. (2003). Timing of treatment and preemptive analgesia. In Rowbotham, D. J. & Macintyre, P. E. (Eds.). *Clinical pain management: Acute pain* (pp. 113–163). London, UK: Arnold.
Kehlet, H., Jensen, T. S., & Woolf, C. J. (2006). Persistent postsurgical pain: Risk factors and prevention. *The Lancet, 367*(9522), 1618–1625. doi: 10.1016/s0140-6736(06)68700-x
Khasabov, S. G., Rogers, S. D., Ghilardi, J. R., Peters, C. M., Mantyh, P. W., & Simone, D. A. (2002). Spinal neurons that possess the substance P receptor are required for the development of central sensitization. *The Journal of Neuroscience, 22*(20), 9086–9098.
Kumasaka, L. (1996). My pain is God's will. *American Journal of Nursing, 96*(6), 45–47.
Latremoliere, A., & Woolf, C. J. (2009). Central densitization: A generator of pain hypersensitivity by central neural plasticity. *The Journal of Pain, 10*(9), 895–926. doi: 10.1016/j.jpain.2009.06.012
Laugsand, E. A., Kaasa, S., & Klepstad, P. (2011). Management of opioid-induced nausea and vomiting in cancer patients: Systematic review and evidence-based recommendations. *Palliative Medicine, 25,* 442–453.
Laureys, S., Faymonville, M. E., Peigneux, P., Damas, P., Lambermont, B., Del, F. G., . . . Maquet, P. (2002). Cortical processing of noxious somatosensory stimuli in the persistent vegetative state. *Neuroimange, 17*(2), 732–741.
Lehne, R. (2009). *Pharmacology for nursing care.* St. Louis, MO: Elsevier Mosby.
Lopez-Martinez, A. E., Esteve-Zarazaga, R., & Ramirez-Maestre, C. (2008). Perceived social support and coping responses are independent variables explaining pain adjustment among chronic pain patients. *The Journal of Pain: Official Journal of the American Pain Society, 9*(4), 373–379.
Lorenz, J., Minoshima, S., & Casey, K. L. (2003). Keeping pain out of mind: The role of the dorsolateral prefrontal cortex in pain modulation. *Brain, 126*(5), 1079–1091. doi: 10.1093/brain/awg102
Love, S., & Coakham, H. B. (2001). Trigeminal neuralgia. *Brain, 124*(12), 2347–2360. doi: 10.1093/brain/124.12.2347
Mader, T. J., Blank, F. S. J., Smithline, H. A., & Wolfe, J. M. (2003). How reliable are pain scores? A pilot study of 20 healthy volunteers. *Journal of Emergency Nursing, 29*(4), 322–325. doi: 10.1067/men.2003.107
Manias, E., Bucknall, T., & Botti, M. (2005). Nurses' strategies for managing pain in postoperative setting. *Pain Management Nursing, 6,* 18–29.
Marchand, S. (2008). The physiology of pain mechanisms: From the periphery to the brain. *Rheumatic Disease Clinics of North America, 34*(2), 285–309. doi: 10.1016/j.rdc.2008.04.003
Marks, D. M., Shah, M. J., Patkar, A. A., Masand, P. S., Park, G.-Y., & Pae, C.-U. (2009). Serotonin-norepinephrine reuptake inhibitors for pain control: Premise and promise. *Current Neuropharmacology, 7,* 331–336. doi: 10.2174/157015909790031201
Mateo, O., & Krenzischek, D. A. (1992). A pilot study to assess the relationship between behavioral manifestations and self-report of pain in postanesthesia care unit patients. *Journal of Post Anasthesia Nursing, 7*(1), 15–21.
McCance, K. L., & Huether, S. E. (2006). *Pathophysiology: The biological basis of disease in adults and children.* St. Louis, MO: Mosby.
McEwen, B. S. (2001). Plasticity of the hippocampus: Adaptation to chronic stress and allostatic load. *Annals of the New York Academy of Science, 933,* 265–277.
McGillion, M. H., Watt-Watson, J. H., Kim, J., & Graham, A. (2004). Learning by heart: A focused group study to determine the self-management learning needs of chronic stable angina patients. *Canadian Journal of Cardiovascular Nursing, 14,* 12–22.
McGillion, M. H., Watt-Watson, J. H., Kim, J., & Yamada, J. (2004). A systematic review of psychoeducational interventions for the management of chronic stable angina. *Journal of Nursing Management, 12,* 1–9.
McGillion, M., Watt-Watson, J., LeFort, S., & Stevens, B. (2007). Positive shifts in the perceived meaning of cardiac pain following a psychoeducation program for chronic stable angina. *CJNR (Canadian Journal of Nursing Research), 39*(2), 48–65.
McIntyre, P. E. (2001). Safety and efficacy of patient controlled analgesia. *British Journal of Anaesthesia, 87,* 36–46.
Mease, P. (2005). Fibromyalgia syndrome: Review of clinical presentation, pathogenesis, outcome measures, and treatment. *The Journal of Rheumatology, 75,* 6–21.
Melzack, R. (1975). The McGill pain questionnaire: Major properties and scoring methods. *Pain, 1,* 277–299.
Melzack, R. (1987). The short-form McGill pain questionnaire. *Pain, 30,* 191–197.
Melzack, R. (1990). The tragedy of needless pain. *Scientific American, 262,* 27–33.
Melzack, R., & Casey, K. L. (1966). Sensory, motivational, and central control determinants of pain. In Kenshalo, D. R. (Ed.), *The skin sense.* Springfield, IL: Charles C. Thomas.
Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science, 150,* 171–179.
Melzack, R., & Wall, P. D. (1973). *The puzzle of pain.* London, UK: Basic Books.
Melzack, R., & Wall, P. D. (1982). *The challenge of pain.* New York, NY: Penguin Books.
Melzack, R., & Wall, P. D. (1996). *The challenge of pain.* (Updated 2nd ed.). New York, NY: Penguin Books.
Melzack, R., Coderre, T. J., Katz, J., & Vaccarino, A. L. (2001). Central neuroplasticity and pathological pain. *Annals of the New York Academy of Sciences, 933*(1), 157–174. doi: 10.1111/j.1749-6632.2001.tb05822.x
Merkel, S., Voepel-Lewis, T., & Malviya, S. (2002). Pain control: Pain assessment in infants and young children: The FLACC Scale. *The American Journal of Nursing, 102*(10), 55–58.
Merkel, S. I., Voepel-Lewis, T., Shayevitz, J. R., & Malviya, S. (1997). The FLACC: A behavioral scale for scoring post-operative pain in young children. *Pediatric nursing, 23*(3), 293–297.
Merskey, H., & Bogduk, N. (Eds.). (1994). *Classification of chronic pain: Description of chronic pain syndromes and definitions of pain terms* (2nd ed.). Seattle, WA: IASP Press.
Morrison, R. S., Magazinger, J., McLaughlin, M. A., Orosz, G., Silberzweig, S. B., Koval, K. J., & Siu, A. L. (2003). The impact of post-operative pain on outcomes following hip fracture. *Pain, 103,* 303–311.
Mularski, R. A., Puntillo, K., Varkey, B., Erstad, B. L., Grap, M. J., Gilbert, H. C., . . . Sessler, C. N. (2009). Pain

management within the palliative and end-of-life care experience in the ICU. *Chest, 135*(5), 1360–1369. doi: 10.1378/chest.08-2328

Munoz, C., & Luckmann, J. (2005). *Transcultural communication in nursing* (2nd ed.). Clifton Park, NY: Thomson Learning.

Oberle, K., Wry, J., Paul, P., Grace, M., Smith, R. A. P., & Shaver, J. F. (1990). Environment, anxiety, and postoperative pain. *Western Journal of Nursing Research, 12*(6), 745–757. doi: 10.1177/019394599001200604

Odhner, M., Wegman, D., Freeland, N., Steinmetz, A., & Ingersoll, G. (2003). Assessing pain control in nonverbal critically ill adults. *Dimensions of Critical Care Nursing, 22*(6), 260–267.

Ohnhaus, E. E., & Adler, R. (1975). Methodological problems in the measurement of pain: A comparison between the verbal rating scale and the visual analogue scale. *Pain, 1*(4), 379–384. doi: 10.1016/0304-3959(75)90075-5

Pasero, C. (2004). Pathophysiology of neuropathic pain. *Pain Management Nursing, 5*(47), 3–8.

Pasero, C., & McCaffery, M. (2010). *Pain assessment and pharmacologic management.* St. Louis, MO: Elsevier Mosby.

Payen, J. F., Bru, O., Bosson, J. L., Lagrasta, A., Novel, E., Deschaux, I., Lavagne, P., & Jacquot, C. (2001). Assessing pain in critically ill sedated patients by using a behavioral pain scale. *Critical Care Medicine, 29*(12), 2258–2263.

Prkachin, K. M. (1992). The consistency of facial expressions of pain: A comparison across modalities. *Pain, 51,* 297–306.

Puntillo, K. A., Miaskowski, C., Kehrle, K., Stannard, D., Gleeson, S., & Nye, P. (1997). Relationship between behavioral and physiological indicators of pain, critical care patients' self-reports of pain, and opioid administration. *Critical Care Medicine, 25*(7), 1159–1166.

Ramage-Morin, P. (2008). Chronic pain in Canadian seniors. *Health Reports, 19*(1), 1–16.

Registered Nurses' Association of Ontario. (2007). *Assessment and management of pain.* Toronto, ON: Registered Nurses' Association of Ontario.

Rinn, W. E. (1984). The neuropsychology of facial expression: A review of the neurological and psychological mechanisms for producing facial expressions. *Psychological Bulletin, 95*(1), 52–77. doi: 10.1037/0033-2909.95.1.52

Rollman, G. B. (1979). Signal detection theory pain measures: Empirical validation studies and adaptation-level effects. *Pain, 6*(1), 9–21. doi: 10.1016/0304-3959(79)90136-2

Rollman, G. B., Abdel-Shaheed, J., Gillespie, J. M., & Jones, K. S. (2004). Does past pain influence current pain? Biological and psychosocial models of sex differences. *European Journal of Pain, 8*(5), 427–433. doi: 10.1016/j.ejpain.2004.03.002

Russell, M. B. R., & Olesen, J. (1996). A nosographic analysis of the migraine aura in a general population. *Brain, 119*(2), 355–361. doi: 10.1093/brain/119.2.355

Saarto, T., & Wiffen, P. J. (2010). Antidepressants for neuropathic pain: A Cochrane review. *Journal of Neurology, Neurosurgery & Psychiatry, 81*(12), 1372–1373. doi: 10.1136/jnnp.2008.144964

Schiff, W. B., Holtz, K. D., Peterson, N., & Rakusan, T. (2001). Effect of an intervention to reduce procedural pain and distress for children with HIV infection. *Journal of Pediatric Psychology, 26*(7), 417–427. doi: 10.1093/jpepsy/26.7.417

Schurks, M., Rist, P. M., Bigal, M. E., Buring, J. E., & Lipton, R. B., & Kurth, T. (2009). Migraine and cardiovascular disease: Systematic review and meta-analysis. *British Medical Journal, 339*(b3914).

Shankland, W. E., 2nd. (2011). Factors that affect pain behavior. *CRANIO: The Journal of Craniomandibular Practice, 29*(2), 144–154.

Slater, R., Cantarella, A., Gallella, S., Worley, A., Boyd, S., Meek, J., & Fitzgerald, M. (2006). Cortical pain responses in human infants. *The Journal of Neuroscience, 26*(14), 3662–3666. doi: 10.1523/jneurosci.0348-06.2006

Statistics Canada. (2003). A profile of disability in Canada. Retrieved from http://www.statcan.gc.ca/pub/89-577-x/4151364-eng.htm - limitations_related_to_pain

Stevens, B. (1999). Pain in infants. In McCaffery, M. & Pasero, C. (Eds.). *Pain: Clinical manual* (pp. 626–673). St. Louis, MO: Mosby.

Stevens, B., Johnston, C., Petryshen, P., & Taddio, A. (1996). Premature Infant Pain Profile: Development and initial validation. *The Clinical Journal of Pain, 12*(1), 13–22.

Stevens, B., Johnston, C. L., Taddio, A., Gibbins, S., & Yamada, J. (2010). The Premature Infant Pain Profile: Evaluation 13 years after development. *The Clinical Journal of Pain, 26*(9), 813–830 doi: 810.1097/AJP.1090b1013e3181ed1070

Stinson, J. N., Kavanagh, T., Yamada, J., Gill, N., & Stevens, B. (2006). Systematic review of the psychometric properties, interpretability and feasibility of self-report pain intensity measures for use in clinical trials in children and adolescents. *Pain, 125*(1-2), 143–157. doi: 10.1016/j.pain.2006.05.006

Taylor, L. J., & Herr, K. (2003). Pain intensity assessment: A comparison of selected pain intensity scales for use in cognitively intact and cognitively impaired African American older adults. *Pain Management Nursing, 4*(2), 87–95. doi: 10.1016/s1524-9042(02)54210-7

Topf, M. (2000). Hospital noise pollution: An environmental stress model to guide research and clinical interventions. *Journal of Advanced Nursing, 31*(3), 520–528. doi: 10.1046/j.1365-2648.2000.01307.x

Torvik, K., Kaasa, S., Kirkevold, O., Saltvedt, I., Holen, J. C., Fayers, P., & Rustoen, T. (2010). Validation of Doloplus-2 among nonverbal nursing home patients—an evaluation of Doloplus-2 in a clinical setting. [Comparative Study/Multicenter Study/Validation Studies]. *BMC Geriatrics, 10,* 9. doi: 10.1186/1471-2318-10-9

Villemure, C., & Bushnell, M. C. (2002). Cognitive modulation of pain: How do attention and emotion influence pain processing? *Pain, 95,* 195–199.

von Baeyer, C. L., & Spagrud, L. J. (2007). Systematic review of observational (behavioural) measures of pain for children and adolescents aged 3 to 18 years old. *Pain, 127*(1-2), 140–150.

Wary, B., Serbouti, S., & Doloplus, C. (2001). Validation d'une échelle d'évaluation comportementale de la douleur chez la personne âgée. *Douleurs, 1,* 35–38.

Watt-Watson, J. (1992). Misbeliefs about pain. In Watt-Watson, J. & Donovan, M. (Eds.). *Pain management: Nursing perspective* (pp. 36–58), St. Louis, MO: Mosby Yearbook.

Watt-Watson, J. H., Clark, A. J., Finley, G. A., & Watson, C. P. N. (1999). Canadian Pain Society position statement on pain relief. *Pain Research and Management, 4*(2), 75–78.

Watt-Watson, J., Evans, R., & Watson, C. P. (1988). Relationships among coping responses and perceptions of pain intensity, depression and family functioning. *Clinical Journal of Pain, 4,* 101.

Watt-Watson, J., Stevens, B., Streiner, D., Garfinkel, P., & Gallop, R. (2001). Relationship between pain knowledge and pain management outcomes for their postoperative cardiac patients. *Journal of Advanced Nursing, 36,* 535–545.

Wolff, A., Vanduynhoven, E., van Kleef, M., Huygen, F., Pope, J. E., & Mekhail, N. (2011). Phantom pain. *Pain Practice, 11*(4), 403–413. doi: 10.1111/j.1533-2500.2011.00454.x

Wu, J. S., Beaton, D., Smith, P. M., & Hagen, N. A. (2010). Patterns of pain and interference in patients with painful bone metastases: A brief pain inventory validation study. *Journal of Pain Symptom Management, 39*(2), 230–240. doi: 10.1016/j.jpainsymman.2009.07.006

Zheng, Z., Gibson, S. J., Helme, R. D., & McMeeken, J. M. (2009). The effect of local anaesthetic on age-related capsaicin-induced mechanical hyperalgesia—a randomised, controlled study. *Pain, 144*(1–2), 101–109. doi: 10.1016/j.pain.2009.03.021

Zhou, Y., Petpichetchian, W., & Kitrungrote, L. (2011). Psychometric properties of pain intensity scales comparing among postoperative adult patients, elderly patients without and with mild cognitive impairment in China. *International Journal of Nursing Studies, 48*(4), 449–457. doi: 10.1016/j.ijnurstu.2010.08.002