CHAPTER

42 Pain Assessment and Management in Children

Felicia must be in pain so soon after her surgery. I know I would have pain if it were me. Can she get pain medicine without getting another needle? —Mother of Felicia, 5

LEARNING OUTCOMES

42.1 Identify the physiologic and behavioral consequences of pain in infants and children.

42.2 Assess the developmental abilities of children to perform a self-assessment of pain intensity.

42.3 Describe the nursing assessment and management for a child receiving an opioid analgesic.

42.4 Explain the physiology that enables nonpharmacologic (complementary) methods of pain control to be effective.

42.5 Assess children of different ages with acute pain and develop a nursing care plan that integrates pharmacologic interventions and developmentally appropriate nonpharmacologic (complementary) therapies.

42.6 Develop a nursing care plan for assessing and monitoring the child having sedation and analgesia for a medical procedure.

KEY TERMS

Acute pain, 0000
Anxiolysis, 0000
Chronic pain, 0000
Deep sedation, 0000
Distraction, 0000
Electroanalgesia, 0000
Equianalgesic dose, 0000
Moderate sedation, 0000
Neuropathic pain, 0000
Nonsteroidal anti-inflammatory drugs (NSAIDs), 0000
Opioids, 0000
Pain, 0000
Patient-controlled analgesia (PCA), 0000
Physical dependence, 0000
Tolerance, 0000
Withdrawal, 0000

Every child has his or her own perception of pain. A neurological response to tissue injury, **pain** is an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Young, 2005). Effective pain management is every child's right.

PAIN

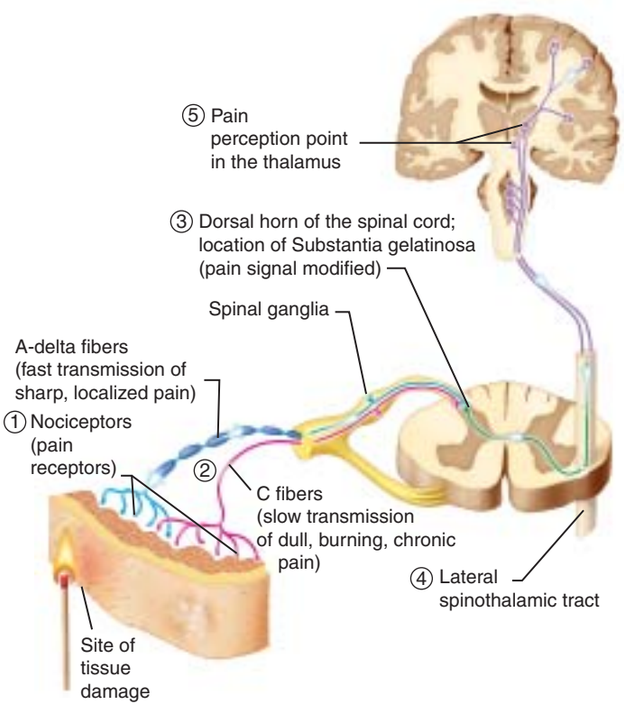
Pain may be either acute or chronic. **Acute pain** is sudden and of short duration that may be associated with a single event, such as surgery, or an acute exacerbation of a condition such as a sickle cell crisis. An immediate pain response occurs immediately at the time of tissue damage, and the inflammatory response that follows the initial injury causes a sustained pain response (see Pathophysiology Illustrated).

Due to a two-way control of nociceptive transmission within the spinal tracts, pain perception can be inhibited or changed when a competing nonpain impulse is sent along the same nerve pathways, a simple explanation of the pain Gate Control Theory. Stimulation of the larger A-delta fibers by ice or massage causes the substantia gelatinosa in the dorsal horn of the spinal cord to "close the gate" and decrease the transmission of pain impulses to the brain. The brain cortex also has bi-directional control of nociceptive transmission and can inhibit some pain stimuli (Huether & Defriez, 2006, p. 453). *Endorphins*, endogenous opioids produced by the brain in response to painful stimuli, help inhibit pain impulses in the spinal cord and the brain (Huether & Defriez, 2006, p. 454).

PATHOPHYSIOLOGY ILLUSTRATED

PAIN PERCEPTION

① *Nociceptors* (free nerve endings at the site of tissue damage) transmit information via specialized nerve fibers to the spinal cord. ② Unmyelinated C fibers slowly transmit dull, burning, diffuse pain as well as chronic pain. Large, myelinated A-delta fibers quickly transmit sharp, well-localized pain. Nociceptors are stimulated by mechanical, thermal, and chemical injury. Biochemical mediators (bradykinin, prostaglandin, leukotrienes, serotonin, histamine, catecholamines, and substance P) are produced in response to tissue damage. These substances help move the pain impulse from the nerve endings to the spinal cord. ③ After the sensory information reaches the substantia gelatinosa in the dorsal horn of the spinal cord, the pain signal may be modified depending on the presence of other stimuli, from either the brain or the periphery. ④ The pain signal is then transmitted through the lateral spinothalamic tract, to the thalamus of the brain where perception occurs. ⑤ Once the sensation reaches the brain, interpretation of pain occurs, and emotional responses may increase or decrease the intensity of the pain perceived.



Chronic pain is a persistent pattern of pain, lasting longer than 6 months; it is generally associated with a prolonged disease process such as juvenile rheumatoid arthritis. Chronic pain may be nociceptive or **neuropathic pain**, initiated or caused by a primary lesion or dysfunction of the nervous system. It does not arouse the sympathetic nervous system in the same way as acute pain. Ongoing stimulation of nociceptors can sensitize the peripheral and central nervous systems leading to neuroanatomical, neurochemical, and neurophysiological changes.

MISCONCEPTIONS ABOUT PAIN IN CHILDREN

Healthcare professionals once believed that children feel less pain than adults. Undertreatment of pain was based on these attitudes about pain and the difficulty and complexity of pain assessment in children. Research has shown that past beliefs about children's perception of pain were incorrect. Even the smallest infants do feel and remember pain. Effective pain treatment is the right of every infant and child. In 2001, the Joint Commission introduced standards for assessing and managing the pain of all patients (Joint Commission, 2007). For a review of past myths and the contrasting reality, see Table 42–1.

DEVELOPMENTAL ASPECTS OF PAIN PERCEPTION, MEMORY, AND RESPONSE

A number of factors influence the pain perceived by the child, including maturation of the nervous system, the child's developmental stage, and previous pain experiences (see Table 42–2). Newborns and infants develop a memory of pain. Preschool-age children demonstrate pain memory by making efforts to delay a painful procedure.

A child's responses to acute or chronic pain are also influenced by other factors such as their understanding of the pain source, their ability to control what will happen, their use of a pain control strategy such as distraction, as well as emotions like fear, anxiety, frustration, and anger (Anthony & Schanberg, 2005). Children also report more pain intensity when recalling a past painful experience than when they rated it the time of its occurrence (von Baeyer, Marche, Rocha, et al., 2004).

Table 42–1 Misconceptions about Pain in Infants and Children

Myth	Reality
Newborns and infants are incapable of feeling pain. Children do not feel pain with the same intensity as adults because a child's nervous system is immature.	The anatomic and functional requirements for pain processing are present early in fetal life. Preterm and full-term newborns may be more sensitive to pain stimuli because of immature spinal cord descending pain control mechanisms (von Baeyer, Marche, Rocha, et al., 2004).
Infants are incapable of expressing pain.	Infants express pain with both behavioral and physiologic cues that can be assessed.
Infants and children have no memory of pain.	Preterm infants have been noticed to associate the smell of alcohol with heel sticks and to try to pull the foot away to avoid the pain. Infants cry in anticipation of immunizations (Young, 2005).
Parents exaggerate or aggravate their child's pain.	Parents know their child and are able to identify when the child is in pain.
Children are not in pain if they can be distracted or if they are sleeping.	Children use distraction to cope with pain, but they soon become exhausted when coping with pain and fall asleep.
Repeated experience with pain teaches the child to be more tolerant of pain and cope with it better.	Children who have more experience with pain respond more vigorously to pain. Experience with pain teaches how severe the pain can become.
Children tolerate discomfort well. They become accustomed to pain after having it for a while.	Children do not tolerate pain any better than adults. Infants may develop pain sensitivity with repeated exposure and have a higher pain reaction (von Baeyer, Marche, Rocha, et al., 2004).
Children recover more quickly than adults from painful experiences such as surgery.	Children heal quickly from surgery, but they have the same amount of pain from surgery as an adult.
Children tell you if they are in pain. They do not need medication unless they appear to be in pain.	Children may be too young to express pain or afraid to tell anyone other than a parent about the pain. The child fears the treatment for pain may be worse than the pain itself.
Children without obvious physical reasons for pain are not likely to have pain.	The cause of pain cannot always be determined. The feeling of pain is subjective and should be accepted by nurses.
Children run the risk of becoming addicted to pain medication when used for pain management.	Addiction is extremely rare when the child is treated for an acute condition (less than 1%) (Plaisance & Logan, 2006).

Table 42–2 The Child's Understanding of Pain, Behavioral Responses, and Verbal Descriptions by Developmental Stage

Age Group	Understanding of Pain	Behavioral Response	Verbal Description
		Infants	
6 months	No understanding of pain; is responsive to parental anxiety	Generalized body movements, chin quivering, facial grimacing, poor feeding	Cries
6–12 months	Has a pain memory; is responsive to parental anxiety	Reflex withdrawal to stimulus, facial grimacing, disturbed sleep, irritability, restlessness	Cries
		Toddlers	
1–3 years	Does not understand what causes pain and why they might be experiencing it	Localized withdrawal, resistance of entire body, aggressive behavior, disturbed sleep	Cries and screams, cannot describe intensity or type of pain Use common words for pain such as *owie* and *boo-boo*
		Preschoolers	
3–6 years (preoperational)	Pain is a *hurt* Does not relate pain to illness; may relate pain to an injury Often believes pain is punishment Unable to understand why a painful procedure will help them feel better or why an injection takes the pain away	Active physical resistance, directed aggressive behavior, strikes out physically and verbally when hurt, low frustration level	Has the language skills to express pain on a sensory level Can identify location and intensity of pain, denies pain, may believe his or her pain is obvious to others
		School-Age Children	
7–9 years (concrete operations)	Does not understand the cause of pain, but understands simple relationships between pain and disease Understands the need for painful procedures to monitor or treat disease May associate pain with feeling bad or angry May recognize psychologic pain related to grief and hurt feelings	Passive resistance, clenches fists, holds body rigidly still, suffers emotional withdrawal, engages in plea bargaining	Can specify location and intensity of pain and describes pain physical characteristics in relation to body parts
10–12 years (transitional)	Better understanding of the relationship between an event and pain Has a more complex awareness of physical and psychologic pain, such as moral dilemmas and mental pain	May pretend comfort to project bravery, may regress with stress and anxiety	Able to describe intensity and location with more characteristics, able to describe psychologic pain
		Adolescents	
13–18 years (formal operations)	Has a capacity for sophisticated and complex understanding of the causes of physical and mental pain Recognizes that pain has both qualitative and quantitative characteristics Can relate to the pain experienced by others	Want to behave in a socially acceptable manner (like adults), show a controlled behavioral response May not complain about pain if given cues that nurses and other healthcare providers believe it should be tolerated	More sophisticated descriptions as experience is gained; may think nurses are in tune with their thoughts, so they don't need to tell the nurse about their pain

Young children are unable to give a detailed description of their pain because of their limited vocabulary and pain experiences. Depending on their developmental stage, children use different coping strategies, such as escape, postponement or avoidance, diversion, and imagery, to deal with pain. Children may not complain of pain for several reasons:

- Some children believe they need to be brave.
- Preschoolers and adolescents may assume the nurse knows they have pain.
- Some children are afraid that it will hurt more to have the pain treated.

Developing Cultural Competence

EXAMINE YOUR OWN EXPERIENCE

Think about your childhood pain experiences and how your family encouraged you to be stoic or to express pain. Such childhood experiences often contribute to a health professional's attitudes about the pain experienced by children. For example, some healthcare providers may believe that being in pain for a little while is not so bad, that pain helps build character, or that using pain medication is a sign of a weak character. However, all nurses need to acknowledge the child's right to pain management, and it is the standard of care.

CULTURAL INFLUENCES ON PAIN

Culture and social learning greatly influence the child's expression of pain. Children are able to perceive pain in the facial expression of others by 5 to 6 years (Deyo, Prkachin, & Mercer, 2004). They observe family members in pain and try to imitate their responses. Through the process of parental approval and disapproval they learn how to behave when in pain, how much pain should be tolerated, how much discomfort justifies a complaint, how to express a complaint of pain, and who to approach for pain relief. See "Developing Cultural Competence: Examine Your Own Experience."

Some cultural groups (people of Italian and Jewish descent) use verbal and nonverbal methods to express pain freely while others (Anglo-Saxon–Germanic, Irish, Amish, and Appalachian) encourage a more stoic response with a diminished expression of pain. However, not all members of a cultural group will demonstrate the same pain response. Children will have individualized responses to pain based on their past experiences.

CONSEQUENCES OF PAIN

Unrelieved pain is stressful and has many undesirable physiologic consequences (Table 42–3). For example, the child with acute postoperative pain takes shallow breaths and suppresses coughing to avoid more pain. These self-protective actions increase the potential for respiratory complications. Unrelieved pain may also delay the return of normal gastric and bowel functions and cause a stress ulcer. Anorexia associated with pain may delay the healing process. Pain drains energy resources needed for healing and growth.

Table 42–3 Physiologic Consequences of Unrelieved Pain in Children

Responses to Pain	Potential Physiologic Consequences
Respiratory Changes	
Rapid shallow breathing	Alkalosis
Inadequate lung expansion	Decreased oxygen saturation, atelectasis
Inadequate cough	Retention of secretions
Neurological Changes	
Increased sympathetic nervous system activity and release of catecholamines	Tachycardia, elevated blood pressure, change in sleep patterns, irritability
Metabolic Changes	
Increased metabolic rate with increased perspiration	Increased fluid and electrolyte losses
Increased cortisol production	Increased cortisol and blood glucose levels
Immune System Changes	
Depressed immune and inflammatory responses	Increased risk of infection, delayed wound healing
Gastrointestinal Changes	
Increased intestinal secretions and smooth muscle sphincter tone, nausea, anorexia	Impaired gastrointestinal functioning, poor nutritional intake, ileus
Altered Pain Response	
Increased pain sensitivity	Hyperalgesia, decreased pain threshold, exaggerated memory of painful experiences

Source: Data from Mitchell, A., & Boss, B. J. (2002). Adverse effects of pain on the nervous systems of newborns and young children: A review of the literature. *Journal of Neuroscience Nursing, 34*(5), 228–236; Walden, M. (2007). Pain in the newborn and infant. In C. Kenner & J. W. Lott, *Comprehensive neonatal nursing: An interdisciplinary approach* (4th ed., pp. 360–371), Philadelphia: Elsevier Saunders; McCance, K. L., Forshee, B. A., & Shelby, J. (2006). Stress and disease. In K. L. McCance & S. E. Huether (Eds.), *Pathophysiology: The biologic basis for disease in adults and children* (5th ed., pp. 447–462), St. Louis: Elsevier Mosby.

Growth and Development

EXPRESSING PAIN

Children slowly acquire words for pain over the first 6 years of life. The pain words used spontaneously by children in one study were as follows: "ouch" as early as 17 months, "hurt" and "ow" by 18 months of age, "boo-boo" by 21 months, "ache" by 36 months, "sore" by 45 months, and "pain" by 72 months (Stanford, Chambers, & Craig, 2005). Other pain words include "owie," "stinging," "sore," "cutting, burning," "itching," "hot," and "tight."

PAIN ASSESSMENT

The goal of pain assessment is to provide accurate information about the location and intensity of pain and its effects on the child's functioning.

PAIN HISTORY

Parents can provide a great deal of information about the child's response to pain, such as the following:

- How the child typically expresses pain. Children and parents use similar terms to describe pain, such as a *hurt, owie, boo-boo, stinging, sore, cutting, burning, itching, hot*, and *tight*. Knowing the appropriate word to use makes communicating with the child easier. The parent can often inform the healthcare team about signs that will help to recognize the child's pain.
- The child's previous experiences with painful situations and reactions.
- How the child copes with and manages pain. The child with several past pain experiences may not exhibit the same types of stressful behaviors as the child with few pain experiences.
- What works best to reduce the child's pain?
- The parent's and child's preferences for analgesic use and other pain interventions.

Ask older children to give a history of painful procedures, but recognize that they may modify their pain descriptions depending on the type of questions asked and what they expect will happen as a result of their response. Examples of questions to ask include the following:

- What kinds of things made you hurt in the past and what made it feel better?
- Do you tell others about being in pain and what do you want them to do for the pain?
- What do you not want done when you are hurting? What would you like the nurse to do for the hurt?
- Where is the hurt, and what does it feel like? What could be causing the hurting?

PAIN ASSESSMENT SCALES

Various pain scales are used to assess pain in children.

Pain Behavior Scales for Nonverbal Children

Physical and behavioral indicators are used to quantify pain in infants and nonverbal children. For example, the Neonatal Infant Pain Scale (NIPS) and the FLACC Behavioral Pain Assessment Scale rely on the nurse's observation of the child's behavior.

The NIPS is designed to measure procedural pain in preterm and full-term newborns up to 6 weeks after birth. The newborn facial expression, cry quality, breathing patterns, arm and leg position, and state of arousal are observed. This tool has high interrater reliability and validity. See Table 42–4.

The FLACC is designed to measure acute pain in infants and young children following surgery, and it can be used until the child is able to self-report pain with another pain scale. FLACC is an acronym for the five categories that are assessed: Face, Legs, Activity, Cry, and Consolability. The tool has validity and reliability for evaluation of postoperative pain (Manworren & Hynan, 2003; Willis, Merkel, Voepel-Lewis, et al., 2003). See Table 42–5.

Young children (3 years and older) can localize pain if given an outline of the front and back of the body. The child can mark where the pain is located or color the area of pain with crayons. The child should use one color for the place where it hurts the most, and another color for areas with less pain. See My Nursing Kit for body outlines to use for pain assessment.

Self-Report Pain Scales

Other scales depend on the child's self-report of pain intensity (see Skill 13–1 SKILLS). To use pain scales, the child must be developmentally ready and understand the concept of a little or a lot of pain well enough to tell the nurse. Children 2 to 3 years of age are usually able to understand the concept of "more or less." This child cannot be given more than three choices on a pain scale (none, some, a lot) when assessing pain. When the child can understand rank order, such as by placing several blocks of different sizes in a row from biggest to smallest, the child is developmentally ready for a numeric scale (Young, 2005) Examples of self-report pain scales for young children include the Faces Pain Scale and the Oucher Scale.

Faces pain rating scale. This scale has a series of six or seven cartoon-like faces with expressions from smiling (or neutral) to tearful, depending upon the model selected. The Wong-Baker scale is commonly used for children from 3 years through adolescence (Figure 42–1 ●). After explanations about the meaning for each face, the child selects the face that is the closest match to the pain felt. Older children can use the words associated with the tool to provide a pain rating. The Faces Pain Rating Scale has good validity and reliability for measuring pain intensity (O'Rourke, 2004). The nurse should not use this tool or the Oucher Scale to compare with the child's facial expression to determine pain level.

Oucher scale. The Oucher Scale presents a series of six photographs of a child expressing increased intensity of pain in combination with

Table 42–4 Neonatal Infant Pain Scale (NIPS)

Characteristic	Scoring Criteria
	Facial Expression
0 = Relaxed muscles	■ Restful face with neutral expression
1 = Grimace	■ Tight facial muscles; furrowed brow, chin, and jaw (Note: At low gestational ages, infants may have no facial expression)
	Cry
0 = No cry	■ Quiet, not crying
1 = Whimper	■ Mild moaning, intermittent cry
2 = Vigorous cry	■ Loud screaming, rising, shrill, and continuous (Note: Silent cry may be scored if infant is intubated, as indicated by obvious facial movements)
	Breathing Patterns
0 = Relaxed	■ Relaxed, usual breathing pattern maintained
1 = Change in breathing	■ Change in drawing breath; irregular, faster than usual, gagging, or holding breath
	Arm Movements
0 = Relaxed/restrained (with soft restraints)	■ Relaxed, no muscle rigidity, random movements of arms
1 = Flexed/extended	■ Tense, straight arms; rigid; or rapid extension and flexion
	Leg Movements
0 = Relaxed/restrained (with soft restraints)	■ Relaxed, no muscle rigidity, occasional random movements of legs
1 = Flexed/extended	■ Tense, straight legs; rigid; or rapid extension and flexion
	State of Arousal
0 = Sleeping/awake	■ Quiet, peaceful, sleeping; or alert and settled
1 = Fussy	■ Alert and restless or thrashing; fussy

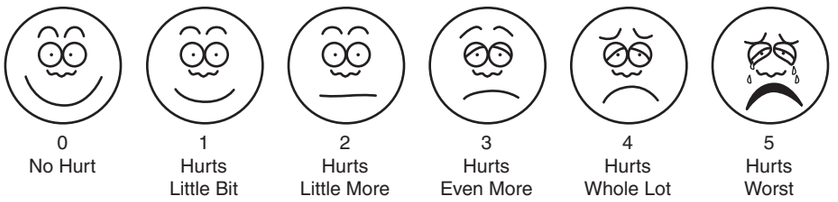
Source: From Lawrence, J., Alcock, D., Mcgrath, D. P., et al. (1993). The development of a tool to assess neonatal pain. *Neonatal network, 12*(6), 61; and Taylor, B. J., Robbins, J. M., Gold, J. I., Logsdon, T. R., Bird, T. M., & Anand, K. J. S. (2006). Assessing postoperative pain in neonates: a multicenter observational study, *Pediatrics, 118*(4), e992–e1000.

Table 42–5 FLACC Behavioral Pain Assessment Scale

		SCORING	
Categories	**0**	**1**	**2**
Face	No particular expression or smile	Occasional grimace or frown; withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs; frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to; distractible	Difficult to console or comfort

Instructions: Observe the child for 5 minutes or longer. Observe the legs and body uncovered. Reposition the patient or observe activity. Assess body for tenseness and tone. Initiate consoling interventions if needed. Each of the five categories is scored from 0 to 2, resulting in a total score between 0 and 10. A total score of 0 = relaxed and comfortable; 1–3 = mild discomfort; 4–6 = moderate pain; 7–10 = severe discomfort or pain.

Source: Used with permission from 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; and Voepel-Lewis, T., Malviya, S., & Tait, A. (2005). Validity of parent ratings as proxy measures of pain in children with cognitive impairment. *Pain Management Nursing, I6*(4), 168–174.

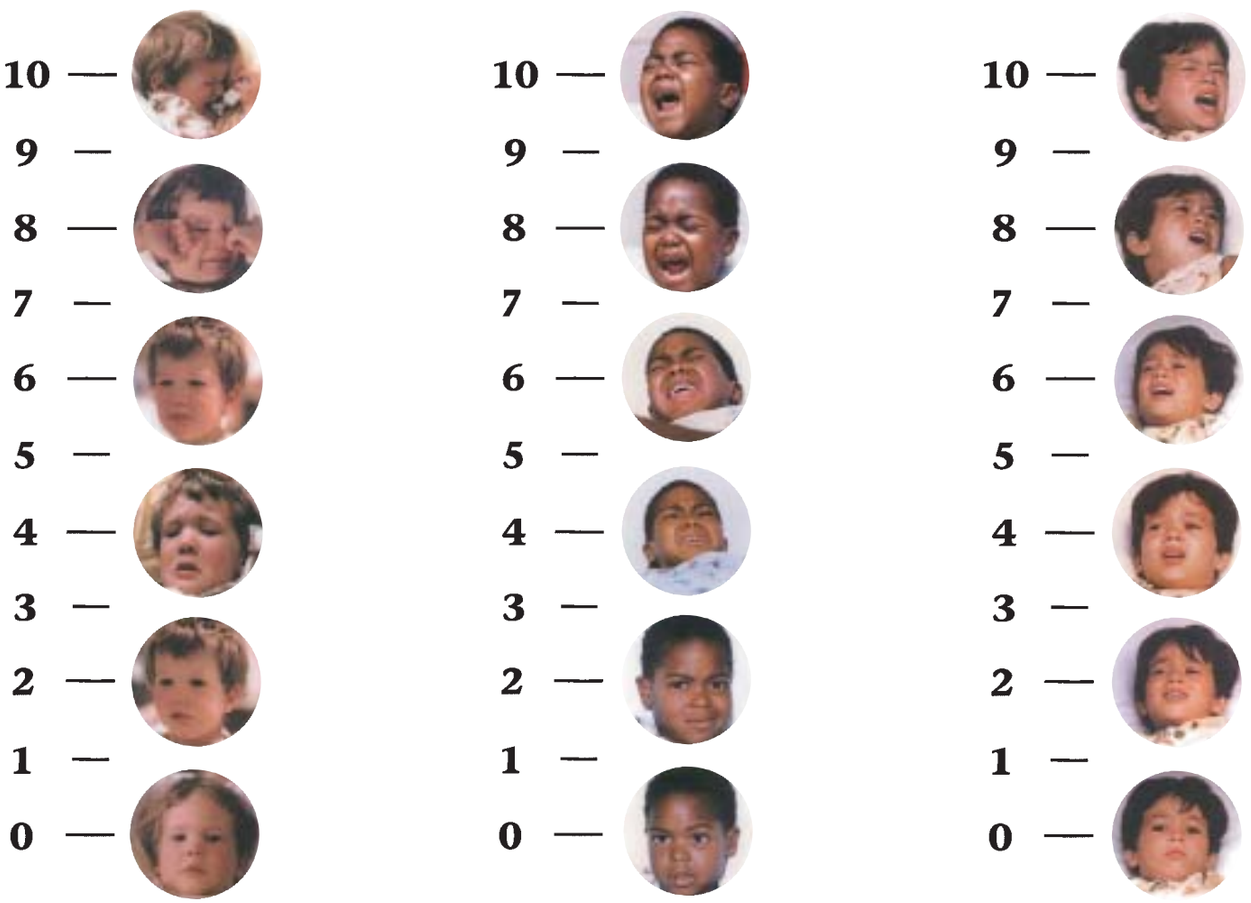


● **Figure 42–1** The Faces Pain Rating Scale. The Faces Pain Rating Scale is valid and reliable in helping children to report their level of pain. Make sure the child has an understanding of number concepts and then teach the child to use the scale. Point to each face and use the words under the picture to describe the amount of pain the child feels. Then ask the child to select the face that comes closest to the amount of pain felt. Use the number under the face to score the pain.

Source: Used with permission from Wong, D. L., & Baker, C. M. (1988). Pain in children: Comparison of assessment scales. Pediatric Nursing, 14, *9–16.*

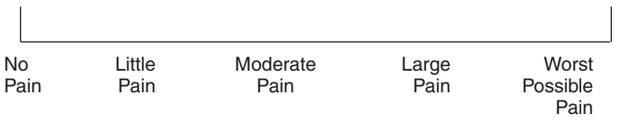
a vertical Visual Analogue Scale (Figure 42–2 ●). The tool has been developed and tested in three cultural groups: Caucasian, African American, and Hispanic. The tools have good validity and reliability for children over 3 years of age (O'Rourke, 2004).

Poker chip tool. This tool uses four checkers or poker chips to quantify pain. The child is asked to pick the number of chips that best match the pain felt, with one chip being a little pain and four being the most pain he or she could have.



● **Figure 42–2** The Oucher Scale. Use the Oucher Scale that is the best match for the ethnicity of the child. After determining that the child has an understanding of number concepts, teach the child to use the scale. Point to each photo and explain that the bottom picture is "no hurt," the second picture is a "little hurt," the third picture is "a little more hurt," the fourth picture is "even more hurt," the fifth picture is "a lot of hurt," and the sixth picture is the "biggest or most hurt you could ever have." The numbers beside the photos can be used to score the amount of pain the child reports.

Source: The Caucasian version of the Oucher used with permission from Judith E. Beyer, RN, PhD, 1983. The African-American version of the Oucher used with permission from Mary J. Denyes, RN, PhD, and Antonia M. Villarruel, RN, PhD, 1990. The Hispanic version of the Oucher used with permission from Antonia M. Villarruel, RN, PhD, 1990.



● **Figure 42–3** The Word-Graphic Rating Scale. Word-Graphic Rating Scale has words rather than numbers under the line. It may be used by itself or with the Adolescent Pediatric Pain tool. Teach the child to use the tool by pointing to the side of the line that is no pain. Then run your finger along the line and tell the child that this location is the worst possible pain. If the child has some pain, ask the child to make a mark along the line that is the best match for the amount of pain felt. Use a millimeter ruler to measure from the "no pain" end of the line to the marked location to identify the pain score. Make sure the line is the same length each time pain is assessed so comparisons can be made.

Source: Used with permission from Sinkin-Feldman, L., Tesler, M., & Savedra, M. (1997). Word placement on the Word-Graphic Rating Scale by pediatric patients. Pediatric Nursing, 23, *31–34.*

School-age children and adolescents have better number concepts and language skills, so additional tools can be used to assess their pain. The nurse should ask the child to describe the pain and give its location. Providing some words such as sharp, dull, aching, pounding, cold, hot, burning, throbbing, stinging, tingling, or cutting can help children describe their pain.

Numeric pain scale. This tool, also called the Visual Analog Scale, is a single 10-cm horizontal or vertical line that has descriptors of pain at each end (no pain, worst possible pain). Marks and numbers are placed at each cm on the line. The child marks the amount of pain felt, and the numbers on the line are used to score the pain.

Word-graphic-rating scale. This tool has words rather than numbers describing increasing pain intensity across a 10-cm Visual Analog Scale without numbers. The child marks the line that is closest to the level of pain felt. A millimeter ruler can be used to quantify the pain and record the pain score (Figure 42–3 ●).

Adolescent pediatric pain tool. This tool includes a human figure drawing, the Word-Graphic Rating Scale, and a choice of descriptive words, e.g., burning, ache, sharp, and dull. Adolescents indicate pain sites on the human figure outline, use the Word-Graphic-Rating Scale as described, and use the word choices to characterize the pain felt. See My Nursing Kit for the human figure outline.

ACUTE PAIN

Children experience acute pain related to a variety of illnesses and injuries, surgery, and invasive procedures. Just as with adults, children are must have their pain assessed and managed.

CLINICAL MANIFESTATIONS

Children have both physiologic and behavioral indicators of pain.

Physiologic Indicators

Acute pain stimulates the adrenergic nervous system and results in physiologic changes, including tachycardia, tachypnea, hypertension, pupil dilation, pallor, increased perspiration, and increased secretion of catecholamines and adrenocorticoid hormones (Huether & Defriez, 2006). These signs demonstrate a complex stress response. The body adapts physiologically to acute pain; the vital signs return to near normal, and perspiration decreases after several minutes, so these signs cannot be used for monitoring pain.

Behavioral Indicators

Newborns and infants demonstrate knitted brows, squinted eyes with cheeks raised, eyes closed, crying, jerky or flailing movements, and stiff posture in response to pain (Stevens, McGrath, Yamada, et al., 2006). See Figure 42–4 ●. Children in acute pain may be distressed and anxious, especially if they have experienced pain previously (Huether & Defriez, 2006; Young, 2005). Behaviors that could indicate pain or anxiety in infants and toddlers include restlessness or agitation, hyperalertness or vigilance, sleep disturbances, and irritability. Children and adolescents may demonstrate the following additional behaviors:

- Short attention span (child is difficult to distract)
- Facial grimacing, biting or pursing lips

● **Figure 42–4** Neonatal pain facial expression. Neonatal characteristic facial responses to pain include bulged brow, eyes squeezed shut, furrowed nasolabial creases, open lips, pursed lips, stretched mouth, taut tongue, and a quivering chin.

Source: Adapted from Carlson, K. L., Clement, B. A., & Nash, P. (1996). Neonatal pain: From concept to research questions and the role of the advanced practice nurse. Journal of Perinatal Neonatal Nursing, 10 *(1), 64–71.*

- Posturing (guarding a painful joint by avoiding movement), remaining immobile, or protecting the painful area
- Drawing up knees, flexing limbs, massaging affected area
- Lethargy, remaining quiet, or withdrawal
- Sleep disturbances

CLINICAL THERAPY

Pain management includes both drug and nondrug measures. Children need adequate pain medication, but complementary therapies can enhance pain management and ultimately reduce the amount of pain medication needed.

Opioids

Opioids are analgesics commonly given for severe pain, such as after surgery or a severe injury. Opioids (e.g., morphine and codeine) may be administered by oral, subcutaneous, intramuscular, and intravenous routes. Administration of opioids by an oral route is as effective as by intramuscular and intravenous routes when the drug is given in an **equianalgesic dose** (the amount of drug, whether given by oral or parenteral routes, needed to produce the same analgesic effect) (see Drug Guide 42–1). Oral and intravenous routes are preferred for children. Rectal preparations of some opioids are also available. The intramuscular and subcutaneous routes cause pain and stress at the time of injection, and titration of the dosage to achieve a desired response level that can occur with intravenous administration is not possible (Zempsky, Cravero, et al., 2004). The optimal analgesic dose varies widely among patients in all age groups (American Pain Society, 2005). Meperidine is rarely used in children because its metabolite has the potential to cause seizures (Brislin & Rose, 2005).

Common side effects include sedation, nausea, vomiting, constipation, urinary retention, and itching, and these should be treated by rotating the opioids used or with specific therapies as follows:

- Sedation – supplement lower opioid dose with nonsedating analgesia (Greco & Berde, 2005)
- Nausea and vomiting – antiemetic, use alternate opioid

Drug Guide

OPIOID ANALGESICS AND RECOMMENDED DOSES FOR CHILDREN AND ADOLESCENTS*

DRUG	APPROXIMATE EQUIANALGESIC ORAL DOSE	APPROXIMATE EQUIANALGESIC PARENTERAL DOSE	RECOMMENDED STARTING DOSE (ADULTS GREATER THAN 50 KG)		RECOMMENDED STARTING DOSE (CHILDREN & ADULTS LESS THAN 50 KG)	
			ORAL	PARENTERAL	ORAL	PARENTERAL
Morphine	30 mg	10 mg	15–30 mg every 3–4 hr	10 mg every 3–4 hr	0.3 mg/kg every 3–4 hr	0.1 mg/kg every 3–4 hr
Codeine	120 mg	75 mg IM or Subcutaneous	30–60 mg every 3–4 hr	60 mg every 2 hr	0.5–1 mg every 3–4 hr[a]	NR
Hydromorphone (Dilaudid)	7.5 mg	1.5 mg	4–8 mg every 3–4 hr	1.5 mg every 3–4 hr	0.06 mg/kg every 3–4 hr	0.015 mg/kg every 3–4 hr
Levorphanol (Levo-Dromoran)	4 mg (acute) 1 mg (chronic)	2 mg (acute) 1 mg (chronic)	2–4 mg every 6–8 hr	2 mg every 6–8 hr	0.04 mg/kg every 6–8 hr	0.02 mg/kg every 6–8 hr
Meperidine (Demerol)	300 mg	75 mg	NR	75 mg every 3 hr	NR	NR
Methadone (Dolophine, others)	10 mg (acute) 2–4 mg (chronic)	5 mg (acute) 2–4 mg (chronic)	5–10 mg every 4–8 hr	10 mg every 4–8 hr	0.2 mg/kg every 4–8 hr	0.1 mg/kg every 4–8 hr
Oxycodone (Roxicodone)	30 mg	NA	15–20 mg every 3–4 hr	NA	0.1–0.2 mg/kg every 3–4 hr[a]	NA
Fentanyl	0.1 mg	0.01 mg	5 mcg/kg Lozenge	50–100 mcg every 1–2 hr	5–15 mcg/kg Oralet[b]	1 mcg/kg every 1–2 hr

NR = Not recommended; NA = Not available

*For all parenteral opioids, start with the low dose and titrate to effective pain control.

[a] Caution: Doses of aspirin and acetaminophen in combination with opioid/NSAID preparation must also be adjusted to the patient's body weight.

[b] The Oralet is not widely used because of nausea and vomiting side effects.

Source: Data from: American Pain Society (2003a). *Principles of analgesic use in the treatment of acute pain and cancer pain*, (5th ed., pp. 14–17), Glenview, IL: Author; and Greco, C., & Berde, C. (2005). Pain management for the hospitalized pediatric patient. *Pediatric Clinics of North America*, *52*(4), 995–1027.

Nursing Practice

Respiratory depression (unresponsiveness and a respiratory rate less than 12 breaths/min in young children) may progress to respiratory arrest and is the major life-threatening complication of opioid administration. Clinical signs that predict the development of respiratory depression include sleepiness, small pupils, and shallow breathing. Children at particular risk for respiratory depression induced by an opioid are those with an altered level of consciousness, an unstable circulatory status, a history of apnea, or a known airway problem such as obstructive sleep apnea. Some hospitals use continuous pulse oximetry when children receiving opioids are at risk for respiratory depression.

Respiratory depression is most likely to occur when the child is sleeping, a state that augments the depressant effect on the respiratory center and potential airway obstruction by the tongue (American Pain Society, 2003a). Identify the time interval before drug-specific peak respiratory depression occurs, and then carefully monitor the child's vital signs during that period to detect respiratory depression. Naloxone is the drug used for reversal of opioids' adverse effects at a dosage titrated to gradually reduce the effects of the opioids without causing withdrawal symptoms (American Pain Society, 2005, p.71).

- Constipation – stool softener, stimulant laxative, increased fluids and dietary fiber
- Urinary retention – bethanechol, catheterization
- Pruritus – antihistamine, use alternate opioids, or naloxone 0.1–0.2 mcg/kg/hr continuous IV infusion (given simultaneously with opioid) (Greco & Berde, 2005)

When given opioids over an extended period of time, children develop *physical dependence*, the physiologic adaptation to an analgesic or sedative drug at the peripheral and central neurons. These children may experience **withdrawal**, the physical signs and symptoms that occur when a sedative or pain drug is stopped suddenly. Severe withdrawal may be seen when children with a physical dependence are given naloxone to treat respiratory depression (Brislin & Rose, 2005). **Tolerance** is an adaptation to an opioid dosage that results in a shorter duration of drug effectiveness over time. For example, a child might develop physical dependence or tolerance after being in an intensive care setting long term with pain management for life-threatening injuries, multiple surgeries, and invasive procedures. See Table 42–6 for signs and symptoms of withdrawal. Children should be slowly weaned off of opioids over 2 to 4 weeks to prevent withdrawal symptoms. One plan is to reduce the daily dose by 10% to 20% over several days. Clonidine may reduce some symptoms of opioid withdrawal.

Acetaminophen and Nonsteroidal Anti-inflammatory Drugs

Nonsteroidal Anti-inflammatory Drugs (NSAIDs) such as aspirin, primarily given orally, are effective for the relief of mild to moderate pain and chronic pain. Drug Guide 42–2 presents recommended dosages of these drugs. They are most commonly used for bone, inflammatory, and connective tissue conditions. An NSAID may be prescribed in combination with an opioid to increase the effectiveness of the narcotic drug, which may ultimately reduce the amount of opioids needed. Acetaminophen is a nonnarcotic analgesic that is used like an NSAID (see Drug Guide 42–3).

Drug Administration

Pain from surgery, major trauma, or cancer is present for predictable periods because of the effects of tissue damage. Pain relief should be provided around the clock. Every effort should be made to give the child analgesics without causing more pain. The preferred routes of administration are intravenous, local nerve block, and oral.

Continuous infusion analgesia is recommended for children with persistent severe pain, since it eliminates peaks and valleys in pain control. Analgesics may also be given intravenously on a scheduled basis (e.g., every 3 to 4 hours). Delays in analgesia administration increase the chances of *breakthrough pain* (pain that emerges as the pain medication wears off resulting in the loss of pain control) and the subsequent anticipation of pain. Giving analgesics on an as-needed basis for acute pain results in the loss of pain control. More medication is often needed to restore pain control than would have been required for continuous infusion analgesia.

Table 42–6 Clinical Manifestations of Opioid or Sedative Withdrawal

System	Signs and Symptoms
Central nervous system	Irritability, increased wakefulness, tremulousness, hyperactive deep tendon reflexes, clonus, inability to concentrate, frequent yawning, sneezing, delirium, hypertonicity, visual or auditory hallucinations
Gastrointestinal system	Feeding intolerance with vomiting, diarrhea, uncoordinated suck and swallow
Sympathetic nervous system	Tachycardia, tachypnea, increased blood pressure, nasal stuffiness, sweating, lacrimation, chills alternating with hot flashes, sweating, fever, salivation

Source: Data from American Pain Society. (2003). *Principles of analgesic use in the treatment of acute pain and cancer pain*. (5th ed.). Glenview, IL: Author; American Pain Society (2005). Guideline for the management of cancer pain in adults and children, Glenview, IL: Author.

Drug Guide

ACETAMINOPHEN, NSAIDS AND RECOMMENDED DOSES FOR CHILDREN AND ADOLESCENTS

ORAL PEAK ACTION TIME	USUAL ADULT DOSE	USUAL PEDIATRIC DOSE	COMMENTS
Nonopioid Analgesic			
Acetaminophen 0.5–2 hr	650–1000 mg every 4 hr	10–15 mg/kg every 4 hr	Lacks the peripheral anti-inflammatory activity of other NSAIDs; rectal suppository available
NSAIDs			
Aspirin 1–2 hr	650–975 mg every 4–6 hr	10–15 mg/kg every 4 hr	Do not use in children under 19 years with possible viral illness (National Reyes Syndrome Foundation, 2005); may cause gastric upset and bleeding; rectal suppository available
Choline magnesium trisalicylate (Trilisate) 2 hr	1000–1500 mg every 12 hr	25 mg/kg every 12 hr	Does not increase bleeding time like other NSAIDs; available as oral liquid
Ibuprofen (Motrin, others) 0.5 hr	200–400 mg every 4–6 hr	6–10 mg/kg every 6–8 hr	Available as oral suspension
Naproxen (Naprosyn) 2–4 hr	250–500 mg every 6–8 hr	5 mg/kg every 12 hr	Available as oral liquid
Ketorolac 0.75–1 hr	30 mg IV loading dose, then 15–30 mg every 6 hours	0.25–0.5 mg/kg IV or IM, every 6 hours	IV or IM use only in children less than 50 kg; should not be used for children with bleeding disorder or at risk for bleeding complications; do not use longer than 5 days (Brislin & Rose, 2005)

Source: Data from: American Pain Society (2003a). *Principles of analgesic use in the treatment of acute pain and cancer pain*, (5th ed., pp. 4–5), Glenview, IL: Author; Greco, C., & Berde, C. (2005). Pain management for the hospitalized pediatric patient. *Pediatric Clinics of North American, 52*(4), 995–1027; and Bindler, R, & Howry, L. (2005). *Pediatric drug guide with nursing implications*, Upper Saddle River, NJ: Prentice Hall.

Evidence in Action

Analgesics were often withheld from children with acute abdominal pain until surgeons could complete an assessment, as it was believed that analgesia would interfere with diagnosis. Recent studies have revealed that children receiving an opioid prior to surgical consultation had lower pain intensity and the clinical signs of an acute abdomen were not obscured (Green, Bulloch, Kabani, et al., 2005; Kokki, Lintula, Vanamo, et al., 2005).

Patient-controlled analgesia. **Patient-controlled analgesia (PCA)** is a method of administering an intravenous analgesic, such as morphine, using a computerized pump programmed by the healthcare professional and controlled by the child (Skill 13–2 SKILLS). After initial pain control has been achieved with a continuous IV infusion of morphine (basal dose), the child presses a button to receive a smaller analgesic dose (bolus dose) for episodic pain relief. This method of pain management is especially useful for pain control in the first 48 hours after surgery when oral pain management is not possible. Safety features to prevent overdoses include the ability to set the maximum number of bolus infusions per hour and the maximum amount of drug received in a specific time period. Children and adolescents benefit from PCA by receiving continuous pain control and having the ability to control their comfort level with no trauma from injections. Once children can take oral analgesics, PCA is discontinued.

Children (often 5 years and older) selected for PCA should be able to self-report pain with a pain scale and understand that pushing the button will give them medication to relieve pain. Parents are sometimes given responsibility for pushing the injection button for younger children or those with disabilities, but concerns about potential overmedication of children with parent-controlled analgesia have been reported (Greco & Berde, 2005). Careful documentation of bolus doses by a family member are important to prevent overmedication. See "Teaching Highlights: Teaching About Patient-Controlled Analgesia."

Regional Pain Management

Epidural pain control provides selective analgesia for a body region, and it has become more common for postoperative pain

Drug Guide

ACETAMINOPHEN

Overview of Action

Produces analgesia by unknown mechanism; acts centrally in the central nervous system by increasing the pain threshold by inhibiting cyclooxygenase. Acts in the hypothalamus to cause antipyresis. Used in treatment of mild to moderate pain and of fever. Does not have anti-inflammatory effects. Does not affect bleeding time.

Routes, Dosage, Frequency

Oral or rectal: 10 to 15 mg/kg/dose every 4 to 6 hours, as needed. Do not exceed 120 mg/day in child 2 to 5 years, or 2.6 g/day in child 6 to 12 years. If not prescribed by healthcare provider, seek medical advice after use for 5 days for pain.

Contraindications: Previous hypersensitivity to the drug. Use cautiously in children with G6PD deficiency, renal or hepatic dysfunction, rheumatoid arthritis, poor nutrition, immunosuppression, or bone marrow depression.

Drug interactions: Chronic coadministration with carbamazepine, phenytoin, barbiturates, and rifampin may increase potential for chronic hepatotoxicity. Cholestyramine may decrease acetaminophen absorption.

Side effects: Liver damage with overdose.

Nursing Implications

- *Assess:* Note hepatic and renal function. Assess pain level or actual temperature prior to administration.
- *Administer:* Follow dosage directions carefully for different liquid preparations, which have different concentrations. Make sure the parent has the correct dispensing spoon or syringe for liquid preparations. Do not give preparations with aspartame to children with phenylketonuria. Plain or chewable tablets may be crushed and given with fluid; avoid giving with high-carbohydrate meals, which can decrease drug absorption.
- *Monitor:* Evaluate the response to medication. Periodic renal and hepatic studies may be ordered for patients on long-term therapy.
- *Patient teaching:* Do not give with other over-the-counter medications such as cold medications which may also contain acetaminophen or aspirin; the dosage will need to be adjusted to prevent overdose. Consult a physician if pain relief is not obtained. Store out of the child's reach as this medication is a frequent cause of childhood poisoning.

Data from: Wilson, B. A., Shannon, M. T., & Shields, K. M. (2009). *Prentice Hall nurse's drug guide*. Upper Saddle River, NJ: Prentice Hall; Dlugosz, C. K., Chater, R. W., & Engle, J. P. (2006). Appropriate use of nonprescription analgesics in pediatric patients. *Journal of Pediatric Health Care, 20*(5), 316–325.

Teaching Highlights

PATIENT-CONTROLLED ANALGESIA (PCA)

- What is PCA? Analgesia means pain relief: you get to control the amount of medicine you receive by using the machine.
- The machine gives the medicine by passing it through the tube that is connected to your intravenous line. When you push the button, the machine pumps pain medicine into the intravenous line to make you feel better.
- The machine limits the amount of medicine you can get to what the doctor orders. You can get any amount up to the maximum by pushing the button repeatedly. The push button will not let you make a mistake if you drop it or roll on it.
- Whenever you feel pain, hurt, or discomfort, push the button to get more medicine. You should be the only one to push the button. Do not let another family member push the button.
- No needles for pain shots are needed as long as the intravenous line is in place.
- The PCA may not relieve all of your pain, but it should make you feel comfortable. Let the nurse know if you think your PCA is not working.
- The PCA will be used until you can take pills or drink liquid pain medicine.

management. A catheter is inserted into either the lumbar or the caudal space. Small doses of drugs are needed for sedation and analgesia. Local nerve blocks, such as a popliteal block for the lower leg or interscalene block (in a muscle of the cervical vertebrae) for the upper extremity are used for anesthesia and analgesia frequently for pain control after surgery.

The regional block is most often performed when the child is anesthetized. A subcutaneous catheter is inserted into the local area for infusion of the analgesia. Pain control is achieved without systemic side effects from the medication. A single dose of local anesthetic agent may be used, or a continuous infusion may be given using a pump (Brislin & Rose, 2005). Tingling felt in the fingers or toes of the affected extremity is the first sign that the nerve block is receding.

NONPHARMACOLOGIC METHODS OF PAIN MANAGEMENT

Complementary therapies are nonpharmacologic methods used for pain management that can be used with analgesics, such as cognitive and behavioral strategies. See "Complementary Care: Complementary Therapies for Pain Control." One or more of these methods may provide adequate pain relief when the child has low levels of pain. When used with analgesics, complementary therapies often enhance the effectiveness of the analgesic or reduce the dosage required.

Complementary Care

COMPLEMENTARY THERAPIES FOR PAIN CONTROL

Cutaneous Stimulation

Gently rub the painful area, massage the skin gently, and hold or rock the child. Touching competes with the pain stimuli that are transmitted from the peripheral nerves to the spinal cord and brain and may reduce the pain felt by the child. Swaddling and containment in fetal position are both methods to reduce the pain responses of neonates (Huang, Tung, Kuo, et al., 2004).

Sucrose Solution

Concentrated sucrose solutions (2 ml of 24% solution) may be used as a pain relief measure in preterm and term newborns up to 1 month of age. Sucrose in contact with the oral mucosa promotes natural pain relief by activating endogenous opioids (Morash & Fowler, 2004). Give the solution 2 minutes before the procedure, and the analgesic effect of sucrose lasts approximately 3 to 5 minutes. Allow the infant to continue sucking on a pacifier or to breastfeed during the procedure to reduce distress and enhance the effectiveness of the sucrose solution.

Distraction

Distraction involves engaging a child in a wide variety of pleasant activities that help focus attention on something other than pain and the anxiety. Examples of distraction activities are listening to music, singing a song, blowing bubbles, playing a game, watching television or a video, and focusing on a picture while counting. Guided imagery and breathing techniques may be forms of distraction for school-age children and adolescents. Virtual reality games were found to be effective distraction for children with acute burn injuries (Das, Grimmer, Sparnon, et al., 2005). Teach parents how to be distraction coaches and suggest developmentally appropriate distraction activities for the child. Children in severe pain cannot be distracted; but do not assume the pain is gone if a child can be distracted.

Guided Imagery

Imagery is a cognitive behavioral process that encourages the child to relax (often with progressive muscle relaxation techniques) and focus on vivid mental images as if they were real, and to ignore things, such as a painful procedure. For example, help the child to visualize and explore a favorite place, do a fun activity, remember a funny story, or be a superhero. Ask the child to think about all the sights, sounds, smells, tastes, and feelings that will help enhance the image and experience. Imagery has been used successfully by school-age children and adolescents to reduce pain and anxiety associated with surgery (Huth, Van Kuiken, & Broome, 2006).

Relaxation Techniques

Relaxation techniques are used to reduce muscle tension that may aggravate pain. Progressive muscle relaxation is one relaxation technique. Teach children to tense and relax different muscle groups, starting with the hands and feet, and then moving to more central muscles. Ask the child to tense a muscle group for 10 seconds and notice how it feels, and then ask the child to relax the muscle group for 10 seconds and compare the feelings. With practice, the child should be able to detect the difference between tense and relaxed muscles and then to reduce the tension. Relaxation techniques may be combined with rhythmic breathing.

Breathing Techniques

Rhythmic deep breaths can be used with distraction or muscle relaxation during a painful procedure, or as a mechanism to reduce stress. Encourage the child or adolescent to take a deep breath, hold it for 5 seconds, and blow out through the mouth, as if to push the tension out or the needle away. Another breathing technique is patterned, shallow breathing. The child is encouraged to take shallow breaths in through the nose and blow out through the mouth while thinking of a particular image. The image could be a train and short breaths could be the "toot, toot" of the train engine.

Hypnosis

Hypnosis is an altered state of awareness facilitating heightened concentration, decreased awareness of external stimuli, increased relaxation, and increased suggestibility. In most cases a therapist uses images and the language of the child to induce relaxation and give posthypnotic suggestions for the relief of anxiety, tension, and pain. Children more easily respond to hypnosis than adults because of their imaginative powers for fun and fantasy. Hypnosis has been successful in assisting children to control acute postoperative pain, procedural pain and stress, and acute pain associated with conditions such as migraine headaches, hemophilia and sickle-cell anemia. Children can be taught self-hypnosis to give them a sense of mastery and control over pain and distress (Richardson, Smith, McCall, et al., 2006).

Application of Heat and Cold

Heat application promotes dilation of blood vessels. The increased blood circulation permits the removal of cell breakdown debris from the site. Heat also promotes muscle relaxation, breaking the pain-spasm-pain cycle. To reduce edema, do not apply heat in the first 24 hours after an injury.

The application of cold is believed to slow the ability of pain fibers to transmit pain impulses. Cold also controls pain by decreasing edema and inflammation, and by causing partial or complete anesthesia or numbness of the skin. When cold is applied, assess the skin for redness or signs of irritation. Take care to prevent thermal injury. Discontinue cold applications immediately if the skin alternately blanches and reddens afterwards.

Electroanalgesia

Also known as transcutaneous electrical nerve stimulation (TENS), electroanalgesia delivers small amounts of electrical stimulation to the skin by electrodes. This electronic stimulation is stronger than the pain impulses and is thought to interfere with the transmission of pain impulses from the peripheral nerves to the spinal cord and brain. TENS may be used for both acute and chronic pain management. The only known side effect is skin irritation at the electrode site.

Acupuncture

A traditional Chinese treatment for pain relief, acupuncture has been gaining greater acceptance in Western medicine. Acupuncture is based on the theory that energy, or chi, flows along channels through the body (meridians) that are connected by acupuncture points. Pain occurs with obstruction of the energy flow, and inserting needles at the appropriate acupuncture points restores the energy flow (Kundu & Berman, 2007). Limited research has been conducted about the use and effectiveness of acupuncture use in children. Because of the use of needles, few children under 10 years will cooperate with the procedure.

NURSING MANAGEMENT

NURSING ASSESSMENT AND DIAGNOSIS

Nurses have an ethical obligation to relieve a child's suffering not only because of the consequences of unrelieved pain but also because appropriate pain management may have benefits such as earlier mobilization, shortened hospital stays, and reduced costs. To provide effective nursing management of children in pain, anticipate the presence of pain and recognize the child's right to pain control.

When assessing pain in children, keep the following questions in mind:

- What is happening in tissues that might cause pain? Assume that children who have had surgery, injury, vaso-occlusive episode, or illness are experiencing pain, since these events also cause pain in adults.
- What external factors could be causing pain? For example, is the cast too tight or is the child poorly positioned in bed?
- Are there any indicators of pain, either physiologic or behavioral?
- How is the child responding emotionally?
- How does the child or parent rate the pain?

Physiologic symptoms such as nausea, fatigue, dyspnea, bladder and bowel distention, and fever may influence the intensity of pain felt by a child. The child's behavior or responses to pain stimuli may also be affected by fear, anxiety, separation from parents, anger, culture, age, or a previous pain experience.

When working with an infant or child, determine which pain scale is the most appropriate for the circumstance and developmental stage. When using a self-report pain assessment tool, *use the same tool each time* you assess for pain or for the evaluation of pain management. This makes comparison of assessment results possible. A chronologic record of the child's pain assessments must be documented along with actions taken to relieve pain, in addition to the follow-up assessments to determine the effectiveness of those actions.

Remember that surgery and trauma can result in multiple sites of pain (incision or laceration, cut or bruised muscles, interrupted blood supply, nasogastric tube placement, insertion sites of intravenous lines). When using pain scales in the assessment of a verbal child, attempt to identify all sites of pain. Then evaluate the intensity of pain at each site.

Examples of nursing diagnoses for children in pain include the following:

- *Acute Pain (abdominal)* related to injury and surgery
- *Anxiety* related to anticipation of pain from an invasive procedure
- *Impaired Physical Mobility* related to pain
- *Nausea* related to opioid pain medication

Other nursing diagnoses are included in the nursing care plan for the child with postoperative pain.

PLANNING AND IMPLEMENTATION

Nursing management involves the following actions to increase and maintain patient comfort: pharmacologic intervention; complementary therapy; monitoring, evaluating, and documenting the effectiveness of pain-control measures to provide optimal comfort; and patient education.

PHARMACOLOGIC INTERVENTION

Give analgesics as ordered by the physician, ensuring that the dose is appropriate for the child's weight. When administering an opioid by intravenous infusion or PCA, monitor the flow rate and the site for infiltration. Follow institutional guidelines for monitoring vital signs, and use a pulse oximeter or cardiorespiratory monitor in children at risk for respiratory depression. Vital signs (heart rate and blood pressure) may not change in response to effective analgesia when infection, trauma, or other stressors keep them elevated. Make sure analgesic antagonists such as naloxone are available should complications develop. Check for the presence of other side effects of analgesics, such as sedation, nausea, vomiting, itching, urinary retention, and constipation. An alternative opioid or medications to treat the side effects may be ordered when analgesia is needed long term.

Oral NSAIDs are generally ordered for less severe pain or chronic pain. These drugs may mask fever. Be alert to the potential complication of gastrointestinal hemorrhage in critically ill children who have increased gastric acids as a physiologic stress response to pain.

Assess the child for pain 15 to 30 minutes following intravenous pain medication and 1 hour after oral pain medication to determine if adequate pain control was achieved. Evaluate the child's level of pain frequently to identify any increase in pain intensity. Use information collected from the child and parent, as well as from an appropriate pain scale. Dramatic reductions in pain should occur, although not all pain may disappear. Be certain to record results of pain-control measures to guide future nursing actions. Use a flowsheet to document assessments and medication administration during the postoperative period.

Many children sleep after receiving an analgesic. This sleep is not a side effect of the drug or a sign of an overdose, but the result of pain relief. Pain interrupts sleep, and once pain is relieved, the child can sleep comfortably. However, sleep does not always indicate pain control. A child in pain may fall asleep in exhaustion. Look for other symptoms of pain, such as excess movement or moaning.

Nursing Practice

Naloxone may be used to treat respiratory depression caused by an opioid drug at a dose and slow infusion rate that does not reverse the pain-control effects of the narcotic. A continuous infusion or repeated doses may be needed for severe overdoses.

Nursing Care Plan

THE CHILD WITH POSTOPERATIVE PAIN

INTERVENTION	RATIONALE	EXPECTED OUTCOME
1. Nursing Diagnosis: Severe Abdominal Pain related to surgery and injury		
NIC Priority Intervention: **Pain management:** Alleviation of pain or a reduction in pain to a level of comfort that is acceptable to the patient		**NOC Suggested Outcome:** Comfort level: Feelings of physical and psychologic ease
Goal: The child will report relief (to a level acceptable to the child on a pain scale).		
■ Give analgesic by a pain-free method.	■ The child may deny pain to avoid analgesia by painful route.	The child reports pain relief after administration of analgesia.
■ Have the child select a pain scale and rate the amount of pain perceived before and 30–60 minutes after analgesia is given to ensure pain relief.	■ The child's pain rating is the best indicator of pain. Maintenance of pain control requires less analgesia than treating each acute pain episode.	
■ Assess pain control each hour to ensure that the child's pain is relieved.	■ Frequent monitoring identifies inadequate pain control before it becomes significant.	
■ Reposition the child every 2 hr to maintain good body alignment.	■ New positions decrease muscle cramping and skin pressure.	
■ Provide therapeutic touch or massage. Encourage the parents to read a story or play favorite music.	■ Complementary therapy reduces stress and enhances the analgesic action.	
2. Nursing Diagnosis: Disturbed Sleep Pattern related to inadequate pain control		
NIC Priority Intervention: **Sleep enhancement:** Facilitation of regular sleep/awake cycles		**NOC Suggested Outcome:** **Sleep:** Extent and pattern of sleep for mental and physical rejuvenation
Goal: The child will experience fewer disruptions of sleep by pain.		
■ Give analgesia by continuous infusion or every 3–4 hr around the clock.	■ Pain breakthrough occurs even during sleep and disturbs the healing effects of sleep.	The child's sleep is undisturbed by pain. Child sleeps for age-appropriate number of hours per day.
3. Nursing Diagnosis: Ineffective Individual Therapeutic Regimen Management related to self-management of pain control and use of nondrug pain-control measures		
NIC Priority Intervention: **Self-modification assistance:** Reinforcement of self-directed change initiated by the patient to achieve personally important goals		**NOC Suggested Outcome:** **Treatment behavior pain control:** Personal actions to palliate or eliminate pain
Goal: The child and family will effectively use patient-controlled analgesia (PCA) and complementary therapy pain-control measures.		
■ Teach the child how the PCA works and when to push the button.	■ The child must know that pain can be relieved by pushing the PCA button and how the button works.	The child's pain rating stays low.
■ Teach the family and the child how to use age-appropriate imagery, distraction, relaxation techniques, and other complementary therapy pain-control measures.	■ Complementary therapy pain-control measures reduce the amount of analgesia needed.	The child and family independently use complementary therapies for pain control.

(continued)

Nursing Care Plan—continued

THE CHILD WITH POSTOPERATIVE PAIN

INTERVENTION	RATIONALE	EXPECTED OUTCOME
Goal: The child and family will use appropriate analgesia after discharge.		
■ Discuss appropriate pain control to use at home after discharge.	■ The family and child may be anxious about pain management at home.	The family understands pain-relief measures for use at home and knows where to call if help is needed.
4. Nursing Diagnosis: Risk for Ineffective Breathing Pattern related to opioid overdose		
NIC Priority Intervention: **Respiratory monitoring:** Collection and analysis of patient data to ensure airway patency and adequate gas exchange		**NOC Suggested Outcome:** **Vital signs status:** Temperature, pulse, respirations, and blood pressure within expected range for the individual
Goal: The child will maintain adequate ventilations.		
■ Verify that correct dose of opioid analgesia is given for the child's weight.	■ Respiratory depression is a significant complication of opioid analgesia when too much analgesia is given.	There is no episode of respiratory depression associated with analgesia.
■ Monitor vital signs and depth of inspirations before analgesic is administered and at time of peak drug action.	■ Respiratory depression episode must not progress to respiratory arrest. All opioids act on brainstem center, which decreases responsiveness to CO_2 tension.	
■ Calculate agonist dose ordered by physician to be sure it will reverse respiratory depression, but not counteract effect of analgesia.	■ Valuable time will be saved if agonist is needed for episode of respiratory depression. Complete reversal of analgesia will cause the child to have significant pain.	
5. Nursing Diagnosis: Constipation related to opioid administration and decreased motility of gastrointestinal tract		
NIC Priority Intervention: **Constipation management:** Prevention and alleviation of constipation		**NOC Suggested Outcome:** **Bowel elimination:** Ability of gastrointestinal tract to form and evacuate stool effectively.
Goal: The child will have minimal constipation.		
■ Palpate the abdomen, and assess bowel sounds and abdominal distention.	■ Signs of constipation must be anticipated and identified.	The child has bowel movements at least every 2 days while on opioid pain control.
■ Request physician order for stimulating laxative and stool softener.	■ Opioids increase the transit time of feces and interfere with bile enzymes needed for evacuation.	
■ Provide fluids of choice to increase fluid intake when IV fluids are decreased.	■ Extra fluids will counteract opioid action of increasing the absorption of water from the large intestine.	
■ Inform family and child that constipation is a side effect of pain medication.	■ Parents can become partners in managing fluid intake and monitoring bowel movements.	

Become an advocate for the child when the dose or type of analgesic ordered is inadequate. When the child with severe pain has been taking opioids for several days, an increasing amount of the opioid may be needed to produce or maintain the same level of pain relief. The duration of effective analgesia becomes shorter than expected, and breakthrough pain occurs. Review the child's record to verify that the opioid was given at the appropriate dose and frequency before asking the physician to modify the child's pain medication.

Thinking Critically

DETERMINING WHEN A CHILD IS IN PAIN

Felicia, who is 5 years old, was struck by a car. Six hours ago, she had surgery to repair a liver laceration, but she also has numerous bruises and abrasions on her body. After spending 3 hours in the postanesthesia unit, she was moved to the pediatric inpatient unit. She has an intravenous line in place, as well as a nasogastric tube attached to low suction. Her abdominal dressing is clean and dry. Felicia has orders for morphine IV every 3 hours around the clock for the first 24 hours.

Felicia's mother is rooming in with her during her hospital stay. Twelve hours after surgery, Felicia is dozing but is responsive to verbal stimuli. Her most recent IV morphine was given 2 hours ago. The nurse attempts to determine how well Felicia's pain is managed. Her facial expression indicates that she is not in pain. Felicia's mother feels that she is resting comfortably.

How do you know whether Felicia is in pain? Can you expect her to tell you if she feels pain? What other pain relief measures could reduce or help to control her pain in the first 24 hours? What is the appropriate dose of IV morphine for Felicia, who weighs 25 kg? What is the timing of assessments of response to pain and potential side effects? What signs of respiratory distress indicate a need for naloxone administration?

Evidence-Based Nursing

CHALLENGES TO ADEQUATE PAIN MANAGEMENT

Clinical Question

Why does adequate management of children with acute pain continue to be a problem despite the increased knowledge about children's needs for pain relief?

Evidence

In the past decade, numerous studies have reported that many children reporting moderate to severe levels of pain were undermedicated. A study conducted in 10 NICUs investigated the pain assessment and management of 250 neonates. Surgery or painful procedures were performed on 96% of the neonates during the 72-hour study period. Wide variability in pain assessment and management was noted in these NICUs. Nurses documented a numeric pain assessment in 88% of neonates while physicians and neonatal nurse practitioners documented a pain assessment for only 36% of the neonates. Study findings revealed the best predictor of neonatal pain management in the 72 hours after surgery was physician pain assessment. In actual practice after major surgery, 84% of neonates received opioids and 35% received nonopioid analgesia, but 7% of neonates received no analgesia. After minor surgery 60% received opioids, 60% received nonopioid analgesia, but 12% received no analgesia (Taylor, Robbins, Gold, et al., 2008).

A university hospital planned a 4-phase organizational change to improve pain management for children by targeting nurse and physician knowledge, attitudes, beliefs, and behaviors. Interventions included an attitude survey, education on individualizing interventions to individual children, nonpharmacologic pain management strategies, interdisciplinary patient care rounds, development of interdisciplinary pain management plans, changing policy to allow nurses to give IV morphine, and to have the anesthesiologist write all pediatric postoperative pain orders. Results demonstrated a progressive increase in pediatric pain assessments, increased doses of pain medication administered, and increased documentation of treatment effectiveness. Nurses valued their role in the decision-making process (Jordan-Marsh, Hubbard, Watson, et al., 2004).

Best Practices

The hospital environment is as important as individual nursing decisions to provide adequate pain management for children. Pediatric nurses need to know how to assess pain in children of all ages, how to select and administer pain medication, and how to use complementary therapies to enhance pain management. Serious gaps in knowledge were found when nursing students were surveyed about their knowledge of pain management (Plaisance & Logan, 2006). A supportive hospital environment is important in helping nursing graduates to complete their learning and to set expectations for the pain management of children.

Critical Thinking

In the clinical setting, identify the infrastructure supports to promote pain management of children, such as pain assessment tools, pain flow sheets, pain management policies and guidelines, educational opportunities, and resources for complementary therapies. Identify additional supports that would help you as an inexperienced nurse to gain competence in pediatric pain management.

COMPLEMENTARY THERAPY

Complementary therapies are the nonpharmacologic methods of pain control that can be used with or without analgesics. One or more of these methods may provide adequate relief of low levels of pain. When used with analgesics, nonpharmacologic techniques often increase the effectiveness of the analgesic or reduce the dosage required. See the "Complementary Therapies for Pain Management" on page 0000. See the "Teaching Highlights: Helping a Child Cope with Pain," to help parents participate in complementary therapies for their child.

Teaching Highlights

HELPING A CHILD COPE WITH PAIN

Parents provide security and help reduce the child's anxiety associated with pain and hospitalization. Children often feel more secure telling their parents about their pain and anxiety. When parents are actively participating in the child's care during hospitalization, teach them about how complementary therapies can be used to enhance the child's pain management. Help the parent select the age-appropriate complementary therapy for the child:

- Infants: holding, cuddling, sucking a pacifier, massage
- Toddlers: massage, stories, bubbles, touch, holding and rocking, music (Figure 42–5 ●)
- Preschoolers: engaging in play, stories, music, imagining being a superhero, watching television or a video
- School-age children: rhythmic breathing, muscle relaxation, guided imagery, talking about pleasant experiences, playing games, listening to radio, watching television or a video
- Adolescents: rhythmic breathing, muscle relaxation, guided imagery, having visitors, playing games, watching television, listening to radio or CD player

● **Figure 42–5** Parent's role in pain management. The presence of the parent is an important part of pain management. Children often feel more secure telling their parents about their pain and anxiety.

INCREASE COMFORT DURING PAINFUL PROCEDURES

Make every effort to increase the child's comfort during painful procedures. Topical anesthetics can be used to reduce the pain associated with an immunization, other injection, intravenous insertion, or venipuncture, or the first needle stick of another procedure. Give time for the medication to become effective. Mechanisms for administration of topical anesthetics include the following:

- Vapocoolant sprays can be used for injections.
- EMLA (eutectic mixture of local anesthetics) cream, an emulsion of 2.5% lidocaine and 2.5% prilocaine, is effective if applied 1 to 2 hours before a needle stick procedure on intact skin in children and infants as young as 3 months of age (Weise & Nahata, 2005). See Figure 42–6 ●.
- L-M-X4, 4%, liposomal lidocaine (formerly called ELA-MAX), is effective if applied 30 minutes before needle stick (Fein & Gorelick, 2006).
- With iontophoresis, a patch containing 10% lidocaine hydrochloride and 0.1% epinephrine is placed over the site of the planned needle stick, and a small machine generates electric current to transport anesthetic into the skin. In about 10 minutes anesthesia reaches a depth of about 10.7 mm (Pasero, 2006).
- The Synera anesthetic patch, containing 70 mg of lidocaine and 70 mg of tetracaine, can be applied for 20 to 30 minutes prior to a procedure to anesthetize the skin for superficial venous access and dermatologic procedures in children older than 3 years (Endo Pharmaceuticals, 2006).
- LET (lidocaine, epinephrine, and tetracaine) is a topical anesthetic for laceration repair. The LET liquid is applied to a cotton ball and taped to the skin and the LET gel is applied to the skin and covered with an occlusive dressing. The anesthetic works in 20 to 30 minutes (Hatfield, Messner, & Lingg, 2006).

A local anesthetic such as lidocaine buffered by sodium bicarbonate or bupivacaine is often injected subcutaneously to provide analgesia for emergent invasive procedures.

Assemble a pain management kit to promote distraction, imagery, and relaxation in children. Include items such as magic wands, pinwheels, bubble liquid, a slinky spring toy, a foam ball, party noisemakers, and pop-up books. It may also be helpful to include items for therapeutic play such as syringes, adhesive bandages, alcohol swabs, and other supplies from a medical kit. The pain management kit may be especially helpful for distracting children who are being prepared for medical procedures.

DISCHARGE PLANNING AND HOME CARE TEACHING

Children are frequently discharged from the hospital with oral analgesics following surgery, injury, or treatment of acute medical conditions. The child usually leaves the hospital or surgical center pain-free, and the parents may not anticipate pain. Provide information about the child's need for pain medication

● **Figure 42–6** Technique for applying EMLA cream. When painful procedures are planned, use EMLA cream to anesthetize the skin where the painful stick will be made. ***A***, Apply a thick layer of cream over intact skin (one half of a 5-g tube). ***B***, Cover the cream with a transparent adhesive dressing, sealing all the sides. The cream anesthetizes the dermal surface in 45 to 60 minutes.

around the clock for the first 1 to 2 days to prevent the child from feeling pain, and the benefits of pain management in promoting the child's healing.

Provide guidance to help parents assess their child's pain, and for school-age children and adolescents to assess their own pain. Teach parents and children about the dosage and frequency of administration and the side effects of the analgesic ordered. Review complementary therapies and encourage children and parents to use the techniques that work best for them.

Remember that many common health problems (otitis media, pharyngitis, and urinary tract infection) have pain as one of the presenting symptoms. Often the only medication prescribed is an antibiotic to clear the infection. This may leave the child in pain for 48 to 72 hours until the antibiotic brings the infection under control. Give parents recommendations for pain control and comfort measures during this period. Review the dose, dosing device, and formulation of acetaminophen used by parents to identify any risk for overdose.

EVALUATION

Expected outcomes of nursing care include the following:

- The child's pain level is assessed frequently and pain management is effective in improving the child's comfort.
- The child successfully uses a PCA pump to control acute pain.
- Age-appropriate complementary therapies enhance the comfort provided by medications.
- Parents maintain the child's pain management after discharge.

CHRONIC PAIN

Some children have medical conditions that cause chronic pain and episodic acute pain, such as rheumatoid arthritis, cancer, headaches, recurrent abdominal pain, and HIV infection. Children and adolescents have reported that chronic and recurrent pain has an impact on the quality of their life and restricts daily living activities such as school attendance, sleep, appetite, social interactions, and recreation (Roth-Isigkeit, Theyen, Stöven, et al., 2005).

CLINICAL MANIFESTATIONS

Physical and psychologic signs and symptoms should be viewed together. The child may perceive pain but not appear to be in pain. Chronic pain of long duration that is persistent or continuous permits physiologic adaptation so normal heart rate, respiratory rate, and blood pressure levels are often seen (Huether & Defriez, 2006). Behavioral indicators of chronic pain may include inactivity, posturing, depression, and difficulty concentrating and sleeping. Chronic pain may be associated with vague and nonspecific symptoms without an easily identifiable cause.

CLINICAL THERAPY

No tools have been developed to assess chronic pain for any child age group. It may be valuable to use multiple tools to assess pain, including a body outline where all pain sites can be marked, a self-report pain scale, and a list of words that describe pain characteristics.

Children with chronic pain need an individualized pain treatment plan with a primary focus on improved function and comfort. Analgesic medications are prescribed, including NSAIDs, acetaminophen, and opioids, often in combination. Complete pain relief may not be possible, and the child may need additional pain medication for acute flare-ups of their condition. Tricyclic antidepressants may be prescribed for their analgesic properties and because depression may be a co-existing condition. Gabapentin, an anti-seizure medication, has efficacy in treating neuropathic pain (Hollan, 2007). Exercise and physical therapy are important to help promote improved function. Complementary therapies are also used.

Nursing Management

When assessing chronic pain in the child, approach pain as if it is the primary problem for attention. View the physical, behavioral, and psychological signs and symptoms together.

- Obtain the history of pain onset, its development over time, intensity, duration, location, what makes it worse or relieves it, and its impact on daily life (sleeping, appetite, school, and social interactions).
- Identify past and other current pain problems in the family. The child may have some learned pain behaviors, such as using pain for attention.

- Identify how much distress the child and family experience with pain, including anxiety, depression, and hopelessness.
- Determine what the family and child believe causes the pain, their response to it, and current methods to treat the pain, including complementary therapies.
- Observe the child's appearance, posture, gait, emotional and cognitive state. Perform a complete neurologic examination. Assess muscle spasms, trigger points, and areas sensitive to light touch (American Pain Society, 2003b).

Monitor pain intensity at each office visit and frequently during hospitalizations. Encourage older school-age children adolescents with recurrent episodes to keep a pain diary to describe the characteristics, timing, activities, and potential triggers of their pain, as well as their response to pain treatment measures. A pain assessment scale should be used to rate the pain intensity before and after medications and other pain-control measures are used. This record can help improve pain management.

Work with the physician or pain management team to individualize the pain management plan to meet the child's needs, family's beliefs and values, and their cultural preferences for care. Assist the child and family to identify age-appropriate and acceptable complementary therapies to help cope with discomfort. Encourage daily exercise to promote function.

Work with the family to proactively manage constipation when the child takes opioids for pain. Constipation is a side effect that does not improve over time (Anghelescu, Oakes, & Hinds, 2006). Fluids and fiber should be added to the diet, and the child should also take a stimulating laxative and potentially a stool softener.

SEDATION AND PAIN MANAGEMENT FOR MEDICAL PROCEDURES

Children undergo a wide variety of painful diagnostic and treatment procedures in the hospital and in outpatient settings. Procedures such as chest tube insertion, arterial puncture, lumbar puncture, bone marrow aspiration, fracture reduction, laceration repair, insertion of a central or peripheral intravenous line, and burn debridement cause significant pain in children. The anticipation of these procedures causes anxiety and emotional distress that can lead to greater pain intensity. Children who have previously experienced severe pain may be unwilling to cooperate with healthcare personnel (Young, 2005).

CLINICAL THERAPY

Sedation

Sedation is a medically controlled state of depressed consciousness used for painful diagnostic and therapeutic procedures. **Anxiolysis** is minimal sedation in which cognitive and motor functions may be impaired. **Moderate sedation** (formerly called conscious sedation) occurs with lower doses of sedatives enable the child to maintain protective reflexes, independently and continuously maintain a patent airway, and make an appropriate response to physical stimuli or verbal command. **Deep sedation** is a controlled state of depressed consciousness or unconsciousness in which protective airway reflexes are lost, but the child can respond to painful stimuli. Ventilation is affected in deep sedation (Doyle & Collett, 2006). See Table 42–7. Sedation may be used alone for nonpainful procedures such as a radiographic study. Analgesia must be given in association with sedation for invasive procedures as the sedated child can still feel pain but cannot communicate its presence.

Drugs for sedation include the following (Boswinkel & Litman, 2005):

- Benzodiazepines: diazepam (Valium), midazolam (Versed), and lorazepam (Ativan)
- Hypnotics or barbiturates: thiopental, pentobarbital, methohexital
- Ketamine
- Propofol (Diprivan) or Etomidate
- Analgesics: Fentanyl, Alfentanil

Every healthcare facility should have guidelines for the use of sedation to ensure safe healthcare practices. Health professionals monitoring the child should have specific qualifications, such as training in pediatric advanced life support. The child must be carefully monitored for respiratory depression and signs of deep sedation as the child, so the airway can be protected and ventilatory support can be provided if needed. Antagonist agents must be available for opioids and benzodiazepines when the effects of sedation and respiratory depression need to be reversed (Coté, 2005).

Table 42–7 Characteristics of Minimal, Moderate, and Deep Sedation

Assessment Factors	Minimal Sedation	Moderate Sedation	Deep Sedation
Airway	Maintains airway independently and continuously	Maintains airway independently and continuously	Unable to maintain airway
Cough and gag reflexes	Reflexes intact	Reflexes intact	Partial or complete loss of reflexes
Level of consciousness	Responds to verbal stimuli	Easily aroused with verbal or gentle physical stimulation	Not easily aroused, responds to repeated or painful stimuli

Source: Adapted from: Doyle, L., & Colletti, J. E. (2006). Pediatric procedural sedation and analgesia. *Pediatric Clinics of North America, 53*, 279–292.

Nursing Practice

Whenever sedation is given, be prepared to monitor the child's vital signs and provide advanced life support if the child should progress to deep sedation. The following equipment should be immediately available: suction apparatus, a bag-valve mask for assisted ventilation with capability of 90% to 100% oxygen delivery, and an oxygen supply (5 L/min for more than 60 minutes). Antagonists to sedative medication must be premeasured and ready to administer.

Nursing management. When the child receives sedation, nursing assessments to monitor the child's status include visual confirmation of respiratory effort, color, and vital signs. Pulse oximetry and other technology may be used for monitoring, but the equipment must not replace visual assessment. Vital signs must be checked every 15 minutes until the child regains full consciousness and level of functioning. If light sedation progresses to deep sedation, maintain a patent airway, and check vital signs every 5 minutes.

Criteria for discharging the child after sedation include the following:

- Satisfactory and stable cardiovascular function and airway patency.
- Easily arousable, with protective reflexes intact.
- Adequate hydration.
- Able to stand and walk without assistance, or the infant holds the head up and sits up unassisted if old enough to do so.
- Discharge status is the same as admission status.

CRITICAL CONCEPT REVIEW

LEARNING OUTCOMES	CONCEPTS
42.1 Identify the physiologic and behavioral consequences of pain in children.	1. Physiologic consequences of acute pain: ■ Tachycardia and rapid shallow breathing. ■ Inadequate cough. ■ Inadequate lung expansion. ■ Depressed immune response. ■ Increased perspiration and loss of electrolytes and fluids. ■ Increased intestinal secretions. 2. Behavioral consequences of acute pain: ■ Short attention span. ■ Irritability. ■ Facial grimacing. ■ Posturing, protecting painful area, immobility. ■ Lethargy or withdrawal. ■ Sleep disturbance.
42.2 Assess the developmental abilities of preschool children to perform a self-assessment of pain intensity.	■ An understanding of more and less ■ Identifying a number larger than another ■ Placing pieces of paper of different sizes in sequential order by size
42.3 Describe the nursing assessment and management for a child receiving an opioid analgesic.	■ Use oral and intravenous route, if possible. ■ Identify the time of peak drug effect and monitor child's vital signs to detect respiratory depression. ■ Observe for nausea, constipation and itching. ■ Have naloxone (Narcan) available for treatment of respiratory distress.
42.4 Explain the physiology that enables nonpharmacologic (complementary) methods of pain control to be effective.	Nonpharmacologic methods of pain control are effective in children due to the Gate Control Theory and decrease the transmission of pain impulses to the brain. The use of methods such as nonpainful touch and massage stimulate the larger A-delta fibers and cause the substantia gelatinosa in the dorsal horn of the spinal cord to "close the gate." This decreases the transmission of pain impulses to the brain.

(continued)

LEARNING OUTCOMES — CONCEPTS

42.5 Assess children of different ages with acute pain and develop a nursing care plan that integrates pharmacologic interventions and developmentally appropriate nonpharmacologic (complementary) therapies.

Interventions common to all ages:
1. Assess pain frequently.
2. Anticipate need for pain medication.
3. Monitor vital signs.

Pharmacologic and nonpharmacologic interventions by age group:
1. Infants and toddlers:
   - Administer oral or intravenous medications around the clock.
   - Hold, swaddle, rock, or provide nonnutritive sucking.
   - Allow infant to suck sucrose solution.
   - Have toddler blow bubbles.
2. Preschooler:
   - Use distraction techniques with the use of a magic wand, pinwheel, or noise maker.
   - Allow child to watch appropriate TV shows or videos.
3. School-age child and adolescent:
   - Instruct in use of PCA or epidural until able to take oral medications.
   - Use hypnotherapy if child is able to cooperate.
   - Engage child in breathing techniques for relaxation.
   - Use guided imagery, visitors, TV, radio, tapes, or CDs for distraction.

42.6 Develop a nursing care plan for assessing and monitoring the child having sedation and analgesia for a medical procedure.

1. Explain procedure to the child and parents.
2. Employ nonpharmacologic methods such as distraction and guided imagery to decrease anxiety.
3. Ensure that emergency equipment and agonist medications are available.
4. Monitor the depth of sedation during the procedure; be prepared to open the child's airway and assist ventilations if deep sedation occurs.
5. Use pulse oximetry and a cardiorespiratory monitor during procedure; monitor vital signs.
6. After procedure is completed, visually monitor vital signs and level of consciousness until child is stable and awake.

CRITICAL THINKING IN ACTION

A 12-year-old boy, Kevin, is recovering from a 4-wheeler crash at a local children's hospital. He was riding the 4-wheeler unsupervised and without permission while his parents were at work. He suffered three broken bones, several lacerations, and an abdominal injury that required surgery. His parents are very worried about his injuries and at the same time angry with him for not following the rules. Kevin appears expressionless in his hospital bed, but cries and grimaces at any slight movement. When asked on a scale of 1–10 (10 being the most pain) how much pain he is feeling, he says a 10. His parents are reluctant to let him have any pain medications because they fear he may become dependent on the medication. His father states that Kevin should be a man and tolerate the pain, and he thinks enduring the pain will teach him a lesson about responsibility. The nurse explains that pain management is necessary to improve Kevin's healing, help him mobilize sooner, and potentially shorten his hospital stay. She explains the physiologic consequences of ineffective pain management and discusses how the medication will help him sleep and rest. She explains that some of pain medications can be addicting, but the chances of Kevin becoming addicted to pain medications for this injury are extremely rare. She also reviews the nonpharmacological methods of relieving pain. The parents are still reluctant to the medications, but agree to conform to the doctor's orders.

1. What are some of the potential physiological consequences to letting Kevin suffer pain?
2. What are some examples of opioid analgesics appropriate for Kevin?
3. What are some examples of NSAIDs available to Kevin?
4. What are the signs of tolerance to the prescribed opioid?

See MyNursingKit for possible responses.

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