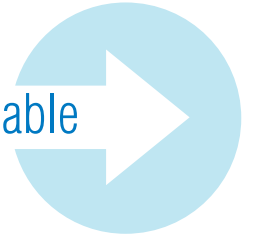


CE Credits available



# Pain:

Current Understanding of  
Assessment, Management,  
and Treatments

Sponsored by  
the American Pain Society



This program is supported by an unrestricted educational grant from NPC. For permission to reprint any of the copyrighted materials herein, contact NPC at (703) 620-6390 or [www.npcnow.org](http://www.npcnow.org).













































































































**Table 27. Other Drugs Used in Pain Management (continued)**

Class	Generic Name	Indications	Uses in Pain	Routes of Administration and Dosage Forms	Potential Side Effects	Comments
NMDA receptor antagonists	Ketamine	General anesthetic	Neuropathic pain (e.g., phantom limb pain), cancer pain, procedural pain (rarely used)	Parenteral	CNS side effects: sedation, ataxia, delirium, hallucinations, psychosis, nightmares, dysphoria Sedation is most common side effect at low doses	Rarely used due to debilitating CNS side effects New NMDA receptor antagonists are in development
N-type calcium channel blocker	Ziconotide	Management of severe chronic pain in patients who are intolerant of or refractory to other systemic therapies, including intrathecal morphine	Management of severe chronic pain in patients who are intolerant of or refractory to other systemic therapies, including intrathecal morphine	Intrathecal	Severe psychiatric symptoms and neurological impairment	Should not be used in patients with history of psychosis

Sources: References 19, 50, 104-106, 183-200a.  
5-HT: 5-hydroxytryptamine (serotonin); 5-HT<sub>1B/1D</sub>: 5-hydroxytryptamine receptor subtypes 1B/1D; CHF: congestive heart failure; CNCP: chronic noncancer pain; CNS: central nervous system; GABA<sub>B</sub>:  $\gamma$ -aminobutyric acid (GABA) type B receptor; GI: gastrointestinal; HSS: hypertrophic subaortic stenosis; HTN: hypertension; LA: long-acting; LBP: lower back pain; MAOI: monoamine oxidase inhibitor; MI: myocardial infarction; NE: norepinephrine; NMDA: N-methyl-D-aspartate; NR: not recommended; OA: osteoarthritis; OTC: over-the-counter (nonprescription); PDN: peripheral diabetic neuropathy; PHN: postherpetic neuralgia; PO: per os (oral); RA: rheumatoid arthritis; RCT: randomized controlled trials; SC: subcutaneous; SE: side effects.

underlying cause of the pain. However, pain management can begin before the source of the pain is determined.

**b. Select the simplest approach to pain management.**

Although invasive methods are sometimes required, most pain can be relieved via simple methods. Cost of treatment is also a consideration in some cases.

**c. Select an appropriate drug.**

Individualization of a pain management regimen begins with selection of an appropriate drug. Factors that guide this process include:<sup>19-20</sup>

- Characteristics of the pain (e.g., duration, intensity, quality)
- Characteristics of the agent (e.g., analgesic ceiling, expected time of onset and duration of analgesia, available routes of administration, dosing interval, side effects, potential

for accumulation of toxic metabolites, potential for addiction)

- Patient factors (e.g., age, coexisting diseases, other medications, preferences, response to previous treatments).

**d. Establish a management plan.**

The next step is to establish a management plan, which may include the later addition of other drugs. Use of several analgesics in combination offers several advantages. It may:

- Allow use of lower doses of some agents, thus reducing the risk of side effects
- Inhibit nociceptive processing at multiple (i.e., peripheral and central) levels, thus enhancing analgesia
- Facilitate treatment of pain in patients who do not respond to a single agent.

Common acceptable combination regimens include: 1) a nonopioid plus an opioid or 2) a nonopioid plus an opioid plus an adjuvant analgesic.<sup>20</sup>

**Table 28. Routes of Administration**

Route	Definition and Notes	Drug Types	Comments
Oral	By mouth (per os) Requires functioning GI tract, intact swallowing mechanism, sufficient GI tract for absorption to occur	Nonopioids, opioids, adjuvant analgesics	Advantages: convenient, noninvasive, cost-effective, flexible, less discomfort than injections with comparable efficacy Disadvantages: requires functional GI system; slow onset of action and relatively delayed peak effects; requires patient compliance
Rectal	Insertion of suppository into rectum	Nonopioids, opioids	Useful in patients who cannot take medications by mouth Any opioid may be compounded for rectal administration
Intramuscular	Injection into large muscle (e.g., gluteus or vastus lateralis)	Some nonopioids, opioids	IM administration should not be used, especially for chronic treatment, due to multiple disadvantages: <ul style="list-style-type: none"> <li>• Painful injections</li> <li>• Wide fluctuations in drug absorption make it difficult to maintain consistent blood levels</li> <li>• Rapid fall-off of action compared with PO administration</li> <li>• Chronic injections may damage tissue (fibrosis, abscesses)</li> </ul> IV and SC injections are appropriate alternatives
Intravenous	Injection into vein; may be single or repetitive bolus or continuous infusion with or without PCA	Some nonopioids, opioids, adjuvant analgesics	IV is most efficient ROA for immediate analgesia and permits rapid titration IV bolus produces rapid onset of effect, but shorter duration of action than IM; not recommended for drugs with long half-lives Continuous IV infusion provides steadier drug blood levels, which maximize pain relief while minimizing side effects
Subcutaneous	Placement of drug just under skin with small needle Continuous SC infusion can be obtained with a small needle	Some opioids	Advantages: produces steady blood levels; time until onset of effect is comparable to IM administration and effects are longer lasting, with less painful administration; cheaper than IV administration; obviates need for GI function Disadvantages: slower onset and offset and lower peak effects than IV administration, time consuming, often disliked by patients
Topical	Applied directly to the skin, where the drug penetrates	NSAIDs, local anesthetics (e.g., lidocaine patch and gel, EMLA®), capsaicin	Advantages: local effect (i.e., no significant serum levels) limits side effects to local reactions; no drug-drug interactions; easy to use, no titration needed Disadvantages: may cause local skin reactions
Transdermal	Absorbed through skin with gradual release into the systemic circulation	Some opioids, adjuvant analgesics	Advantages: convenient, noninvasive, provides prolonged, relatively stable analgesia Disadvantages: delayed onset of action with first dose, drug absorption influenced by internal or external heat
Oral transmucosal	Delivery of drug to mouth, including sublingual (under tongue) and buccal/gingival administration	Some opioids	Advantages: easy, requires little staff supervision; avoids significant liver metabolism associated with oral opioids Disadvantages: variable absorption, bitter taste, dose is limited
OTFC	Fentanyl incorporated into a sweetened matrix on a stick for consumption	Fentanyl	Some absorption via oral mucosa, but most via GI tract; yields higher drug levels and better bioavailability than oral fentanyl
Intranasal	Small aerosol device placed inside nostril that delivers a calibrated dose of a drug	Butorphanol, sumatriptan	Takes advantage of rich blood supply to nose and also avoids significant liver metabolism associated with some drugs
Intraspinal	Epidural and intrathecal administration (see Table 29)		
Other (sublingual, vaginal)	Placement of drug under the tongue (sublingual) or in the vagina	Opioids	Most opioids can be absorbed sublingually or vaginally in patients who have problems such as impaired swallowing, short gut syndrome, or poor IV access

Sources: References 19, 20, 69, and 201.

EMLA®: Eutectic Mixture of Local Anesthetics (lidocaine and prilocaine); GI: gastrointestinal; IM: intramuscular; IV: intravenous; NSAIDs: nonsteroidal anti-inflammatory drugs; OTFC: oral transmucosal fentanyl citrate; PCA: patient-controlled analgesia; PO: per os (oral); ROA: route of administration; SC: subcutaneous.

**e. Select a route of administration.**

No single route of drug administration is appropriate for all clinical situations. Patient factors (e.g., preferences, comfort, convenience, GI function) and drug characteristics (e.g., absorption, half-life) influence the selection of an appropriate route. Table 28 reviews advantages and disadvantages of various routes of administration.

Oral administration of drugs, especially for chronic treatment, is generally preferred because it is convenient, flexible, and associated with stable drug levels.<sup>19</sup> Although often used, IM administration has multiple disadvantages (e.g., pain, erratic absorption, fluctuating drug levels, tissue fibrosis), thus should not be used.<sup>19,24</sup>

Intravenous (IV) administration provides a rapid onset of pain relief and, along with rectal, sublingual, and subcutaneous administration, is useful in patients who cannot take medications by mouth. Continuous infusions produce consistent drug blood levels but are expensive, require frequent professional monitoring, and may limit patient mobility.<sup>19</sup> Transdermal administration is a convenient alternate means of continuous drug delivery that does not involve needles or pumps.<sup>202</sup> Some data suggest that some patients prefer transdermal opioid (fentanyl) to sustained-release oral morphine.<sup>203-205</sup>

Table 29 describes some “high-tech” methods of providing analgesia, including patient-controlled analgesia (PCA), intraspinal (epidural and intrathecal) drug administration (neuroaxial blockade), and other interventional techniques. PCA permits administration of a small dose of drug upon patient command and is especially useful in patients expected to require opioids over a period that exceeds 12 hours. It has mostly been used for IV administration of opioids for acute pain (e.g., postoperative pain), but newer PCA techniques include subcutaneous and epidural drug administration.<sup>208</sup> Interventional methods of analgesia include tissue infiltration (e.g., trigger point injections with local anesthetics), sensory nerve blocks, sympathetic blocks, spinal injections (e.g., epidural injections of corticosteroids, caudal blocks, nerve root injections), and continuous spinal analgesia (e.g., infusion of opioids, clonidine, baclofen) (Table 29). Nerve blocks can be used for diagnostic, prognostic, and therapeutic purposes.

**f. Titrate the dose.**

It may be necessary to titrate the dose of an analgesic to achieve an optimal balance between

pain relief and side effects. The goal is to use the smallest dosage necessary to provide the desired effect with minimal side effects.<sup>19</sup> Nonopioids have a ceiling effect and may cause significant toxicity at high doses. However, most opioids do not have an analgesic ceiling, so the dosage can be titrated upwards until pain relief occurs or limiting side effects develop.

**g. Optimize administration.**

Medications can be administered around-the-clock (ATC) after an optimal dose over a 24-hour interval is determined.<sup>19</sup> Experts recommend ATC dosing for patients with continuous pain, because it provides superior pain relief with fewer side effects.<sup>19</sup> It also helps to break the undesirable undermedication-overmedication cycle that often develops with use of PRN medications alone. However, a short-acting, rapid-onset PRN medication should be used to manage breakthrough pain (i.e., pain that “breaks through” pain relief provided by ongoing analgesics). PRN dosing is also useful for intermittent pain, but patients need to be taught to request pain medication early, before the pain becomes severe.

**h. Watch for and manage side effects.**

Patients with new or altered analgesic regimens should be observed and assessed for side effects as well as pain relief. Tables 20, 23, 24, and 26 review some specific approaches to managing common side effects of nonopioid, opioid, and adjuvant analgesics. The general strategy to managing side effects consists of:<sup>19</sup>

- Changing the dosage or route of administration (to achieve stable drug levels),
- Trying a different drug within the same class, and/or
- Adding a drug that counteracts the effect (e.g., antihistamine for pruritus, laxative for constipation).

Combination therapy can alleviate some side effects. For example, adding a nonopioid or adjuvant analgesic to an opioid regimen may allow use of a lower dose of the opioid. Severe side effects, on occasion, may require administration of an opioid antagonist (e.g., naloxone for opioid-induced respiratory depression).<sup>19</sup> Use of agents with potentially hazardous metabolites (e.g., meperidine) should be restricted to short-term treatment.<sup>19</sup>

**Table 29. PCA and Regional Anesthesia**

Route	Definition	Example Drug Types	Comments
PCA	Use of infusion pump that allows patient to self-administer small doses of analgesics via one of several routes (e.g., IV, SC, epidural)	Opioids (e.g., morphine, hydromorphone, fentanyl, meperidine), some NSAIDs	Used for numerous surgeries (e.g., C-section, abdominal, orthopedic) and medical conditions (cancer pain, sickle cell crisis, burn pain, HIV pain, pancreatitis, kidney stones, fractures) Advantages: less delay in onset of analgesia than PRN dosing Compared with IM, improved analgesia with smaller doses of opioids and fewer side effects Disadvantages: Patient must understand technique, so less useful in some clinical populations
Single or repetitive epidural bolus	Injection or infusion of agent into the epidural space via insertion of a needle (single bolus) or catheter (repetitive bolus)	Opioids (e.g., morphine, fentanyl, hydromorphone), local anesthetics (e.g., bupivacaine, ropivacaine), corticosteroids, clonidine, baclofen	Used for diagnostic and therapeutic nerve blocks; the latter include surgeries (e.g., C-section, gynecologic, urological surgeries) Advantages: simple, no need for infusion device, delivery to site close to site of action (spinal cord) permits more intense analgesia (greater analgesia for given drug) Disadvantages: limited number of suitable agents, higher incidence of side effects, requires personnel to reinject catheter, higher risk of catheter contamination, does not permit PCA
Continuous epidural	Continuous infusion of agent(s) into the epidural space via a catheter. A long-term catheter can be tunneled under the skin or surgically implanted for long-term pain management (e.g., cancer pain, CNCP)	Opioids, local anesthetics	Used for acute pain (e.g., postoperative, obstetrical, posttraumatic pain) and chronic pain (e.g., cancer pain, neuropathic pain) Advantages: permits concomitant use of local anesthetic and shorter-acting opioids, eliminates need for catheter reinjection, reduces rostral spread of analgesia, less risk of catheter contamination, greater potency than systemic administration Disadvantages: Potential for catheter migration and side effects (e.g., of skin and subcutaneous tissue around catheter site; rarely, hematoma, abscess, or meningitis)
PCEA	Continuous infusion of drugs into epidural space, controlled by a patient-operated infusion pump	Opioids	Allows patient to manage dynamic changes in pain related to activity
Bolus or continuous intrathecal (spinal)	Injection or infusion of agent into the subarachnoid space via insertion of a needle (single bolus) or catheter (repetitive bolus); an indwelling intrathecal catheter can be placed for long-term analgesia to reduce the risk of infection	Opioids (e.g., morphine, hydromorphone, fentanyl), local anesthetics (e.g., lidocaine, bupivacaine, mepivacaine)	Uses include cancer pain (regionalized pain below T1), neuropathic pain Single bolus more commonly used for acute pain due to difficulty in maintaining indwelling intrathecal catheters. May be cost-effective for patients with cancer or CNCP Advantages: provides intense analgesia at lower doses than systemic administration Disadvantages: can be difficult to titrate drug effect, risk of infection and other side effects Onset and duration of effect reflect lipid solubility of agent; greater effects of drug at given dose than with systemic administration
Local infiltration	Infiltration of various body structures with local anesthetics and/or corticosteroids	Local anesthetics (e.g., bupivacaine), corticosteroids	Used for acute pain (e.g., postoperative pain, postoperative joint pain, acute bursitis, tendonitis, muscle spasm) and chronic pain (e.g., painful scars, neuromata, trigger points for myofascial syndromes, arthritis, facet syndrome)
Spinal nerve block	Blockade of spinal neurons outside the spinal canal in the paravertebral region or anywhere along its course	Local anesthetics	Includes cervical spinal blocks, occipital blocks, thoracic spinal blocks, lumbar and sacral spinal nerve blocks, sympathetic blockade Used for severe acute or chronic pain (e.g., postoperative, posttraumatic, postamputation, PVD, cancer pain, visceral pain, CRPS, neuralgias)
Topical application	Application of local anesthetics to skin (e.g., patch, gel, cream, paste)	Topical local anesthetics (e.g., lidocaine, EMLA®); other local anesthetics (e.g., cocaine, benzocaine)	Oral agents used for pain in mucous membranes of mouth Topical anesthetics used for procedural pain (EMLA®) and some chronic pain (e.g., lidocaine patch or gel for postherpetic neuralgia)

Sources: References 19, 69, 206-207.

C-section: Cesarean section; CNCP: chronic noncancer pain; CRPS: chronic regional pain syndrome; EMLA®: Eutectic Mixture of Local Anesthetics (lidocaine and prilocaine); HIV: human immunodeficiency virus; IM: intramuscular; IV: intravenous; NSAIDs: nonsteroidal anti-inflammatory drugs; PCA: patient-controlled analgesia; PCEA: Patient controlled epidural analgesia; PRN: as needed; PVD: peripheral vascular disease; SC: subcutaneous.

**i. Differentiate among tolerance, physical dependence, and addiction and appropriately modify therapy.**

Section I.E.5 reviews the definitions of tolerance, physical dependence, and addiction recently recommended by the American Society of Addiction Medicine (ASAM), the American Academy of Pain Medicine (AAPM), and the American Pain Society (APS).<sup>209</sup> Confusion regarding these terms is common and adversely influences pain management.

Tolerance normally occurs with use of certain agents (e.g., opioids). Its earliest sign is a decrease in the duration and/or degree of pain relief, which can be managed by increasing the drug dose and/or frequency of administration.<sup>19</sup> Combining opioids with nonopioids, or switching to a lower dose of another opioid, may delay the development of opioid tolerance.<sup>19</sup> However, the latter approach requires a great deal of care and significant expertise.

Signs of physical dependence include the appearance of an abstinence syndrome with abrupt cessation or diminution of chronic drug administration.<sup>19</sup> The nature and time of onset of this syndrome vary with drug actions and half-life. Slow tapering of the drug (e.g., 10-15% reduction in dosage per day or every other day) usually avoids the appearance of an abstinence syndrome.<sup>210</sup>

Although not usually encountered in patients without a history of preceding drug abuse, the administration of some drugs (e.g., opioids) may cause addiction. Signs of drug craving and/or drug-seeking behavior (e.g., missed appointments with after-hour calls for prescription renewals; solicitation of prescriptions from multiple physicians; reports of lost, destroyed, or stolen medications; selling and buying drugs off the street)<sup>19</sup> should alert the clinician to such a possibility. However, diagnosing addiction requires extreme caution. Similar behaviors, called “pseudoaddiction,” sometimes occur in patients who are not receiving adequate pain management (e.g., doses of opioids too low or infrequent).<sup>211</sup> It is critical that addiction be diagnosed because it is a treatable but serious condition and failure to treat it will hinder efforts to manage pain.

**j. Avoid use of placebos to treat pain.**

Placebos are sometimes used to assess whether pain is responsive to sympatholysis or other

interventions. However, the deceptive use of placebos to treat pain is considered unethical and inappropriate.<sup>19</sup>

## B. NONPHARMACOLOGIC TREATMENTS FOR PAIN

Pharmacologic approaches to pain management are the mainstay of treatment for acute pain and cancer pain and are increasingly being used to manage chronic noncancer pain (CNCP). However, optimal pain management also includes psychological, physical rehabilitative, and in some cases, surgical treatment strategies. For example, the 1992 Agency for Health Care Policy and Research clinical practice guideline on acute pain management recommends cognitive-behavioral approaches (e.g., patient education, simple relaxation, imagery, hypnosis, and biofeedback) and physical therapeutic agents and modalities (e.g., superficial heat or cold, massage, exercise, immobility, and electroanalgesia) as part of the management of acute pain.<sup>24</sup>

Nonpharmacologic strategies should supplement, but not replace, the use of medications.<sup>24</sup> In addition to supplementing the pain-relieving effects of analgesics, nonpharmacologic approaches offer other advantages. For example, they can improve mood, reduce anxiety, increase a patient’s sense of control, strengthen coping abilities, assist with sleep, relax muscles, and improve quality of life.<sup>212-213</sup> Factors that influence the choice of a nonpharmacologic approach to pain management include the pain type, duration, and severity; the patient’s preferences, coping skills, and capabilities; the availability of support (e.g., family members); the availability of care within the community; and cost.

### 1. Psychological Approaches

Psychological interventions used in pain management include contingency management, cognitive behavioral therapy, biofeedback, relaxation, imagery, and psychotherapy. Table 30 defines these terms and describes potential uses of these methods. Some methods (e.g., relaxation, imagery) are simple and can be taught

quickly, whereas others require more time. Patient education materials (e.g., printed instruction sheets, audiotapes) can supplement, but not replace, clinician efforts to instruct patients in these methods.<sup>24</sup>

Patients in whom psychological interventions may be most appropriate include those who express interest in such approaches, manifest anxiety or fear, have inadequate pain relief after appropriate pharmacologic interventions, or experience chronic or recurrent pain.<sup>24</sup> When pain is acute, psychological preparation (such as preparation for surgery or for an invasive procedure) or psychological intervention such as relaxation may help to control the affective dimension of pain.<sup>218</sup> This, in turn, helps minimize the biological stress response that the patient experiences, as well as emotional distress and suffering.<sup>215</sup> When pain is chronic, learning history and operant conditioning (Table 30) sometimes contribute to the persistence of pain and disability, and counterproductive beliefs may impede a positive response to medical intervention.<sup>214</sup> Therefore, psychological methods are typically an integral part of the interdisciplinary approach to the management of chronic pain. Because such management usually involves rehabilitation, psychological approaches are typically integrated with rehabilitation efforts built around physical therapy.

Psychologists rarely treat pain directly but rather work with other health care professionals to integrate psychological principles into the interdisciplinary management of pain. For example, a psychologist can improve communication between a health care provider and patient or work with a clinician to alter the characteristics of a treatment regimen (e.g., complexity, dosing frequency, cost). Such psychological interventions may help assess and enhance patient adherence with treatment (e.g., medications, physical therapy), thus increasing the probability of successful management.<sup>e,215</sup> Unfortunately, psychological approaches to pain management are not used as often as they should be,<sup>215</sup> due to a variety of reasons (e.g., lack of awareness of the role of psychological factors in the response and adaptation to pain, time constraints, reimbursement policies).

<sup>e</sup> One reason that medical interventions sometimes fail or minimally succeed is poor patient adherence to treatment regimens. Estimates of the prevalence of medication nonadherence for the population as a whole are relatively high (30% to 60%), and patients tend to underreport poor adherence and overreport good adherence.<sup>219</sup> Although few studies have addressed the prevalence of nonadherence with pain medication regimens, it appears to be a problem.<sup>220-222</sup>

## 2. Physical Rehabilitative Approaches

Physical rehabilitative methods of pain management are appropriate for many types of pain and are essential in patients with CNCP. In addition to relieving pain, such methods can reduce fear and anxiety, improve physical function, and alter physiological responses to pain. Treatments used in physical rehabilitation include stretching, exercises/reconditioning (to improve strength, endurance, and flexibility), gait and posture training, and attention to ergonomics and body mechanics.<sup>182</sup> Other non-invasive physical treatments for pain include thermotherapy (application of heat), cryotherapy (application of cold), counter-irritation, and electroanalgesia (e.g., transcutaneous electrical stimulation) (Table 31).<sup>182</sup> In some cases, patients choose to pursue non-allopathic (alternative treatments) such as acupuncture or therapeutic massage.

## 3. Surgical Approaches

Most pain can be managed by simple noninvasive methods. However, more invasive approaches, including surgery, are sometimes needed. Orthopedic approaches to pain management include both nonsurgical (“conservative”) approaches and various surgeries (e.g., total joint replacement, laminectomy, spinal fusion). Neurosurgical procedures for managing pain include neurolysis (i.e., injection of a chemical or application of heat or cold to destroy neural tissue), neuroaugmentation procedures, and neuroablative surgeries (i.e., disruption of neural signals and/or removal of neural structures associated with pain).<sup>229</sup> For example, microvascular decompression of the trigeminal nerve is sometimes used to manage trigeminal neuralgia.

Although beyond the scope of this monograph, a variety of other surgical approaches to pain management exist. Other sources (e.g., Bonica’s *Management of Pain*, 3rd ed.) provides complete coverage of these methods.

**Table 30. Examples of Psychological Methods Used to Manage Pain**

Intervention	Definition	Purpose/Goals	Uses
Patient education	Provision of detailed information about disease or interventions and methods of assessing and managing pain (e.g., preoperative instruction about importance of deep breathing, coughing, and ambulating postoperatively; teaching patients with chronic pain about what may aggravate and relieve pain)	Can reduce pain, analgesic use, and length of hospital stay	Postoperative pain, chronic pain
Contingency management <sup>a</sup>	CM involves the manipulation of environmental consequences of pain behavior in a way that helps patients to modify their behavior; it involves use of social reinforcers to increase “well behavior” (e.g., exercise, non-medical conversation) and decrease “sick role” behavior	Refers to methods not for treating the pain per se but rather helping patients to change behaviors Studies suggest that CM effectively reduces pain	Chronic pain
CBT	CBT combines cognitive therapy techniques (e.g., attention diversion) with behavioral techniques (e.g., relaxation, assertiveness training); there are two major CBT subtypes: cognitive restructuring and coping skills training	Helps patients alter their perceptions or labeling of pain (i.e., decrease negative thoughts, emotions, and beliefs), increase sense of control, and decrease maladaptive behaviors	Chronic pain especially, but also useful for acute pain
Cognitive restructuring	Type of CBT in which patients are taught to monitor and evaluate negative thoughts	The goal is to generate more accurate and adaptive thoughts	Chronic pain
Coping skills training	Type of CBT that helps patients develop coping skills, which includes relaxation and imagery techniques, adaptive coping self-statements, and group psychotherapy	Directed at helping patients to develop skills to manage pain and stress	Multiple types of pain (see below)
Relaxation with imagery	Includes progressive muscle relaxation, imagery, visualization, and meditation One of most widely used nonpharmacologic treatments for pain that can increase focus on feelings of well-being as well as diminish tension, anxiety, depression, and pain-related inactivity. <sup>b</sup>	Relaxation decreases patient’s focus on pain, muscle tension, and autonomic and emotional arousal; imagery provides a competing cognitive focus, which can block the perception of pain	Postoperative pain, chronic headache, chronic LBP, cancer pain, arthritis pain, labor pain, TMD
Hypnosis	Technique in which a patient’s susceptibility to suggestion is heightened, facilitating modification of memory and perception; hypnosis can be used alone or as a means of enhancing the effectiveness of another clinical intervention	Hypnosis may provide comfort and reduce anxiety and suffering associated with acute, recurrent, and chronic types of pain; it reduces cortical activation associated with painful stimuli	Postoperative, burn, dental, labor, cancer, procedural, neuropathic, and musculoskeletal pain; headache
Distraction	Includes repeating reaffirming phrases, singing, talking, etc., to distract attention from unpleasant awareness of pain; in patients with CNCP, it also may include social and recreational activities	The goal is for the patient to actively occupy his or her attention with an activity or topic other than pain	Multiple acute and chronic types of pain
Biofeedback	Patient learns to take voluntary control over physiological body activities by receiving input (e.g., visual or auditory cues) about these activities (e.g., heart beat, muscle tension, skin temperature)	Directed at teaching a patient how to take control of body responses via mental activity	Most support for use with vascular HA; also used for chronic LBP and other HA, myofascial pain, rectal pain
Psychotherapy	Treatment for a mental illness or maladaptive behaviors that involves a therapist establishing a relationship with a patient to achieve certain goals; includes individual (supportive and dynamic), group, and family psychotherapy	Goals of psychotherapy include modifying symptoms, changing maladaptive behaviors, and promoting growth and development	Chronic pain, cancer pain, pain associated with HIV infection

Sources: References 24, 72, and 214-218.

<sup>a</sup>The terms “contingency management” and “operant conditioning” are used interchangeably. Overlap exists between CM and CBT, but CM focuses more on modifying behavior and CBT helps more with altering patient perceptions or labeling of sensations.<sup>214</sup>

<sup>b</sup>These methods can be taught quickly but patients do best with encouragement from health care professionals and family members.

Audiotapes and printed materials also can be helpful.<sup>24</sup>

CBT: cognitive-behavioral therapy; CM: contingency management; CNCP: chronic noncancer pain; HA: headache; HIV: human immunodeficiency virus; LBP: low back pain; TMD: temporomandibular disorder.

**Table 31. Examples of Physical Methods Used to Manage Pain**

Intervention	Definition	Purpose/Goals	Examples of Uses
Stretching	Gentle exercise to improve flexibility	Improve ROM, function, comfort	Arthritis, LBP, fibromyalgia, myofascial pain syndrome
Exercise/reconditioning	Reconditioning exercises can improve strength and endurance as well as combat stiffness and weakness associated with pain-related inactivity	Useful in regaining muscle and tendon strength, as well as improving ROM, endurance, comfort, and function Transforms painful activities into more easily tolerated ones Minimizes atrophy, demineralization, and deconditioning	Arthritis, LBP, fibromyalgia, CRPS
Gait and posture training	Appropriate attention to gait and posture, including preventive and therapeutic ergonomics	Relieve pain and restore function; prophylaxis against further pain	LBP, neck pain, tension HA
Applied heat or cold	Application of cold (cryotherapy) to decrease pain and swelling and improve function; later application of heat (thermotherapy) to augment performance and diminish pain	Application of cold produces local analgesia, slows nerve conduction, and promotes tendon flexibility  Application of heat produces local analgesia, dilates (widens) blood vessels, and promotes flexibility	Acute trauma (e.g., injury, surgery); repetitive trauma, arthritis, muscle pain or spasm, acute LBP
Immobilization	Reduction of activity and avoidance of strain for certain duration; may involve brace to assist, restrict, or limit function of joint	May be needed to maintain proper alignment during post-injury repair but is generally harmful for patients with CNCP	Some postoperative, injury (e.g., fracture)
TENS	Selective stimulation of cutaneous receptors sensitive to mechanical stimuli (mechanoreceptors) by applying low-intensity current via skin electrodes <sup>a</sup>	TENS can reduce pain and analgesic use and improve physical mobility, presumably by interfering with transmission of nociceptive impulses in nerve fibers	Trauma, postoperative, labor, abdominal pain; neuralgias, other neuropathic pain, PVD, angina, musculoskeletal pain
PNS SCS IC	Electrical stimulation of selected regions of the nervous system via implantable devices <sup>b</sup>	The goal of electrical stimulation is to disrupt nociceptive signaling	Chronic pain of the trunk and limbs (e.g., PVD), neuropathic pain (deafferentation, poststroke pain), cancer pain
Massage	Rubbing of painful or nonpainful adjacent area	Facilitates relaxation and decreases muscle tension and pain	Postoperative pain, arthritis, fibromyalgia
Acupuncture	Old Chinese healing technique involves insertion of fine needles into the skin at varying depths; application of pressure at acupuncture sites is called acupressure	Acupuncture may cause the secretion of endorphins and interfere with transmission of nociceptive information to relieve pain	Postoperative, radiculopathy, chronic LBP, fibromyalgia

Sources: References 24, 72, 182, and 223-228.

<sup>a</sup>TENS appears to work best when applied to skin close to the pain's site of origin and when sense of touch and pressure are preserved.

<sup>b</sup>The implanted portion of the device consists of a pulse generator and leads connected to electrodes located in fascia in close proximity to a peripheral nerve (PNS), the spinal canal (SCS), or brain (IC). The patient or clinician controls stimulation using non-implanted system components.

CNCP: chronic noncancer pain; CRPS: chronic regional pain syndrome types I and II; HA: headache; IC: intracerebral stimulation; LBP: lower back pain; PNS: peripheral nerve stimulation; PVD: peripheral vascular disease; ROM: range of motion; SCS: spinal cord stimulation; TENS: transcutaneous electrical nerve stimulation.





---

Section IV:

Management of Acute  
Pain and Chronic  
Noncancer Pain

## A. ACUTE PAIN

This section reviews the general approach to the treatment of acute pain, including treatment goals, therapeutic strategies, and elements of pain management. It also provides an overview (i.e., summary tables) of the treatment of some common types of acute pain.

### 1. Treatment Goals

As addressed in Section I.C.1, acute pain is a complex multidimensional experience that usually occurs in response to tissue trauma. Whereas responses to acute pain may be adaptive, they can have adverse physiologic and psychological consequences (e.g., reduced tidal volume, excessive stress response, progression to chronic pain, inability to comply with rehabilitation, patient suffering and dissatisfaction). Acute pain is more difficult to manage if permitted to become severe,<sup>1</sup> so prompt and adequate treatment of acute pain is imperative. Treatment goals and strategies for acute pain can be summarized as:

- Early intervention, with prompt adjustments in the regimen for inadequately controlled pain
- Reduction of pain to acceptable levels
- Facilitation of recovery from underlying disease or injury.

### 2. Therapeutic Strategies

#### a. Multimodal analgesia

Recent research on postoperative pain management supports a treatment approach known as “multimodal analgesia” or “balanced analgesia.” This approach involves the use of more than one method or modality of controlling pain (e.g., drugs from two or more classes, drug plus nondrug treatment) to obtain additive beneficial effects, reduce side effects, or both.<sup>2</sup> These modalities may operate through different mechanisms or at different sites (i.e., peripheral versus central actions). One example of multimodal analgesia is the use of various combinations of opioids and local anesthetics to manage postoperative pain.<sup>3-5</sup> Table 32 summarizes some specific examples of multimodal therapy.

**Table 32. Examples of Multimodal Therapy**

Combination of Agents	Example
Systemic NSAID <sup>a</sup> plus systemic opioid	PO Ibuprofen plus PO hydromorphone
Systemic NSAID plus epidural opioid and local anesthetic	IV ketorolac plus epidural fentanyl and bupivacaine
Systemic NSAID plus local infiltration of anesthetic plus systemic opioid	IV ketorolac plus lidocaine infiltration of surgical site plus IV PCA morphine
Regional block plus systemic NSAID plus epidural opioid and local anesthetic	Intraoperative anesthetic plus IV ketorolac plus postoperative fentanyl and bupivacaine epidural

Source: Reference 6.

<sup>a</sup>NSAIDs need to be used with care in surgical patients due to the risk of bleeding (“anti-platelet” effect).

IV: intravenous; NSAID: nonsteroidal anti-inflammatory drugs; PCA: patient-controlled analgesia; PO: per os (oral).

Benefits of multimodal analgesia include earlier oral intake, ambulation, and hospital discharge for postoperative patients as well as higher levels of participation in activities necessary for recovery (e.g., physical therapy).<sup>6-7</sup> It also may reduce postoperative morbidity, mortality, and costs.<sup>8</sup> Some pain experts advocate revision of traditional postoperative care programs to include accelerated multimodal postoperative recovery programs.<sup>9</sup> Additional potential applications of multimodal analgesia include other types of acute, as well as chronic, pain.<sup>2</sup>

#### b. Preemptive analgesia

Preemptive analgesia refers to the administration of one or more analgesic(s) prior to a noxious event (e.g., surgery) in an attempt to prevent peripheral and central sensitization, minimizing post-injury pain (see I.B.7,8). Compelling evidence of the efficacy of preemptive analgesia exists in animal models, and human studies have produced some promising results. For example, the preoperative administration of selective cyclooxygenase-2 (COX-2) inhibitors decreased use of morphine after spinal fusion surgery in one recent study.<sup>10</sup> There is also some evidence that preoperative epidural blockade (local anesthetic and opioid with or without clonidine) may reduce the incidence of phantom limb pain in patients undergoing limb amputation.<sup>11-12</sup>

However, other studies have failed to confirm that preemptive analgesia prevents phantom

limb pain.<sup>a,13-14</sup> Furthermore, a recent review of 40 controlled clinical studies revealed no difference in the intensity and duration of postoperative pain after preemptive analgesia with a variety of drugs.<sup>15</sup> This failure to demonstrate clinical efficacy may reflect failure to identify the optimum method or timing for instituting the analgesia. Some investigators contend that multiple factors (e.g., extent and nature of the damaged tissue, duration of the surgery, choice of drug, route and timing of administration, time course of central sensitization) may influence the ability to demonstrate a preemptive analgesic effect.<sup>16</sup> Thus, clinical research into its potential clinical benefits is continuing.

### 3. Elements of Treatment

#### a. Pharmacologic management

Pharmacologic management is the cornerstone of acute pain management. Multiple factors (e.g., pain intensity, quality, and pattern; patient preferences; drug side effect profiles) influence the selection of medications. Most acute pain is nociceptive and responds to nonopioids and opioids. However, some adjuvant analgesics (e.g., local anesthetics) also are used to manage acute pain.

In general, mild somatic pain responds well to oral nonopioids (e.g., acetaminophen, nonsteroidal anti-inflammatory drugs [NSAIDs]), topical agents (e.g., local anesthetics), and physical treatments (e.g., rest, ice, compression, elevation).<sup>1</sup> Moderate to moderately severe acute pain is more likely to require opioids.<sup>17-18</sup> Nonopioids often are combined with opioids to improve pain relief and diminish the risk of side effects. Various factors (e.g., preferred route of administration, time of onset, dosing frequency, side effect profile) influence the choice of individual agents in a drug class.

Excessive concern about addiction and regulatory scrutiny heavily contribute to the undertreatment of pain (see I.E.4.5). Analgesics, espe-

cially opioids, are underprescribed and underdosed for both acute and chronic pain. Moderate to severe acute pain should be treated with sufficient doses of opioids to safely relieve the pain. If drug side effects preclude achieving adequate pain relief, the side effects should be treated and/or another opioid should be tried. The concomitant use of other analgesics (e.g., nonopioids, local anesthetics) and nonpharmacologic methods (e.g., applied heat or cold, electroanalgesia, relaxation) maximizes pain relief and minimizes the risk of treatment-limiting side effects.

#### b. Nonpharmacologic approaches

Nonpharmacologic approaches to acute pain management should supplement, but not replace, analgesics.<sup>1</sup> However, the medical condition of some patients with acute pain (e.g., severe trauma or burns) may limit the use of nonpharmacologic therapy. Postoperative patients who receive preoperative instruction in simple psychological methods (Table 30) such as relaxation and imagery are especially likely to benefit. Thus, instruction in nonpharmacologic methods of pain management is an important part of the preoperative assessment (Table 12). Physical methods of pain management can be helpful in all phases of care, including immediately after tissue trauma (e.g., rest, application of cold, compression, elevation) and late during the healing period (e.g., exercises to regain strength and range of motion) (Table 31).

### 4. Management of Some Common Types of Acute Pain

Table 33 defines and presents examples of some common types of acute pain, including pain associated with an acute illness, perioperative pain, posttraumatic pain (major and minor), procedural pain, and obstetrical pain. Tables 34 to 36 summarize some pharmacologic and nonpharmacologic approaches to the management of these types of pain. The former category is divided into medications administered via systemic routes (Table 34) and those administered regionally (i.e., regional anesthesia) (Table 35). The reasons these pain types were selected for discussion include:

- Their relatively high prevalence
- The availability of effective pharmacologic and nonpharmacologic methods of management
- The availability of clinical practice guidelines

<sup>a</sup> Nikolajsen and colleagues<sup>13</sup> found that the rate and intensity of phantom and stump pain, as well as the consumption of opioids, did not differ significantly between 29 patients randomly assigned to receive epidural bupivacaine and morphine before, during, and for 1 week after the lower-limb amputation and 31 control-group patients who received epidural saline before and during the amputation then oral or intramuscular morphine. Lambert et al.<sup>14</sup> reported that a perioperative epidural block started 24 hours prior to amputation was not superior to the intra- and post-operative infusion of a local anesthetic via a perineural catheter in preventing phantom pain. However, the former did provide better relief of stump pain during the immediate postoperative period.

**Table 33. Common Types of Acute Pain**

Type or Source	Definition	Source or Examples
Acute illness	Pain associated with an acute illness	Appendicitis, renal colic, myocardial infarction
Perioperative (includes postoperative) <sup>a</sup>	Pain in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or both	<ul style="list-style-type: none"> <li>• Head and neck surgery</li> <li>• Chest and chest wall surgery</li> <li>• Abdominal surgery</li> <li>• Orthopedic and vascular surgery (back, extremities)</li> </ul>
Posttraumatic (major trauma)	Includes generalized or regionalized pain due to a major acute injury	Motor vehicle accident
Posttraumatic (minor trauma)	Pain due to a minor acute injury	Sprain, laceration
Burns	Pain due to thermal or chemical burns	Fire, chemical exposure
Procedural	Pain associated with a diagnostic or therapeutic medical procedure	Bone marrow biopsy, endoscopy, catheter placement, circumcision, chest tube placement, immunization, suturing
Obstetrical	Pain related to labor and delivery	Childbirth by vaginal delivery or Cesarean section

Sources: References 1 and 19.

<sup>a</sup>The American Society of Anesthesiologists defines acute pain in the perioperative setting as “pain that is present in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or a combination of disease-related and procedure-related sources.”<sup>19</sup> Thus, perioperative pain includes postoperative pain (i.e., pain that follows surgery).

(CPGs) outlining appropriate care

- Evidence of undertreatment and/or nonadherence to relevant CPGs.

These tables merely provide an overview of treatments. They do not consider all of the risks associated with treatments or the needs of special populations. The reader should refer to the appropriate CPGs to make specific management decisions.

## B. CHRONIC NONCANCER PAIN

This section reviews general approaches to the treatment of chronic noncancer pain (CNCP), including treatment goals, therapeutic approaches, and elements of treatment. It also provides general information about the treatment of some common types of CNCP (i.e., summary tables) and identifies relevant clinical practice guidelines (CPGs).

### 1. Treatment Goals

As discussed in Section I.C.4, CNCP is a debilitating condition that often is associated with significant physical, emotional, and social disability. A complex interaction among these

factors contributes to the persistence of pain. Therefore, treatment should address important social and psychological consequences of the pain as well as any physical pathology. Usually this entails a comprehensive approach that includes medication and functional rehabilitation.<sup>28</sup>

Functional rehabilitation helps the patient develop skills to manage the pain. It includes patient education, regular assessment, management of contributing illnesses (e.g., depression), and the setting of attainable treatment goals.<sup>28</sup> The latter should take into account factors such as the patient’s acceptance of his or her condition, the patient’s motivation to participate in treatment, the patient’s ability to follow through with recommendations, and the available time and resources.<sup>29</sup> General treatment goals for CNCP include:<sup>2,28-30</sup>

- Diminish suffering, including pain and associated emotional distress
- Increase/restore physical, social, vocational, and recreational function
- Optimize health, including psychological well-being
- Improve coping ability (e.g., develop self-help strategies, reduce dependence on health care system) and relationships with others (e.g., family, friends, health care professionals).

**Table 34. Systemic Medications for Acute Pain Management**

Pain Type or Source	Nonopioids	Opioids	Adjuvant Analgesics	Other	Comments
Acute illness	Acetaminophen, NSAIDs	Systemic opioids			
Perioperative pain <sup>a</sup>	Acetaminophen, NSAIDs <sup>b</sup>	Systemic opioids <sup>c</sup> ; including PCA <sup>d</sup>	Local anesthetics (e.g., lidocaine, bupivacaine <sup>e</sup> )		Use multimodal therapy when possible Recognize needs of special populations Scheduled ATC dosing generally preferred to PRN
Major trauma (generalized pain)	Acetaminophen, NSAIDs during post-trauma healing phase	Bolus or continuous IV opioids <sup>f</sup> during emergency phase; PO or IV opioids during healing phase	IV ketamine (very rare)	Inhaled NO	Use of ketamine is restricted to pain refractory to other treatments due to severe CNS side effects Inhaled NO is used for incident pain
Major trauma (regionalized pain)	NSAIDs (parenteral, oral) during post-trauma healing phase	Bolus or continuous IV opioids during emergency phase plus regional anesthesia	IV ketamine (very rare)	Inhaled NO	Use of ketamine is restricted to pain refractory to other treatments due to severe CNS side effects Inhaled NO is used for incident pain
Burns	Acetaminophen, NSAIDs during rehabilitative phase (i.e., no early role)	High doses of IV opioids (e.g., morphine, fentanyl) ± PCA for NPO patients; oral opioids (e.g., morphine, hydromorphone) when taking PO	Parenteral ketamine (very rare) IV lidocaine (very rare)	BNZ Inhaled NO	Use of ketamine is restricted to pain refractory to other treatments due to severe CNS side effects Inhaled NO is used for incident pain Infusion of low-dose lidocaine is restricted to burn pain refractory to opioids Lorazepam or midazolam for background and procedural anxiolysis
Minor trauma	Acetaminophen, NSAIDs	Opioids for mild-to-moderate pain			
Procedural pain	NSAIDs for preemptive analgesia and post-procedural pain	IV opioids (e.g., morphine, hydromorphone, fentanyl) unless contraindicated <sup>g</sup>	Local anesthetics (e.g., EMLA <sup>®</sup> , lidocaine, bupivacaine, ropivacaine) IV ketamine	BNZ (e.g., diazepam, lorazepam, midazolam) Inhaled NO Propofol <sup>h</sup>	Local anesthetics may be applied topically (e.g., EMLA <sup>®</sup> ), injected into tissue, or used for nerve blocks Use of ketamine limited by severe CNS side effects
Obstetrical pain		Bolus IV opioids (e.g., fentanyl, hydromorphone, morphine)			

Sources: References 1 and 17-24.

<sup>a</sup>The American Society of Anesthesiologists defines acute pain in the perioperative setting as pain that is present in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or a combination of disease-related and procedure-related sources.<sup>19</sup> Thus, perioperative pain includes postoperative pain (i.e., pain that follows surgery).

<sup>b</sup>Unless contraindicated, NSAIDs (and acetaminophen) are recommended for mild-to-moderate postoperative pain, and parenteral ketorolac may be used for moderate-to-severe pain.<sup>1</sup> Continue nonopioids even after adding opioids for opioid-sparing effects.<sup>1</sup>

<sup>c</sup>Moderately severe to severe postoperative pain should initially be treated with an opioid analgesic with or without an NSAID.<sup>1</sup> Morphine is the standard agent for opioid therapy; if contraindicated, hydromorphone may be substituted.<sup>1</sup>

<sup>d</sup>Preferred route of administration is IV (bolus or continuous PCA). Rectal and subcutaneous are alternative routes of administration. Switch to oral administration when the patient can take medication by mouth.

<sup>e</sup>Local anesthetics may be combined with opioids for intraspinal analgesia or used for regional nerve blocks.

<sup>f</sup>Titrate opioids carefully to maintain stable cardiovascular and respiratory status. Monitor neurological and neurovascular status continuously in patients with head injury or limb injury, respectively.<sup>1</sup>

<sup>g</sup>Contraindications to opioid analgesia include altered sensorium, full-term pregnancy, lung disease, or inability to monitor and manage certain side effects (e.g., respiratory depression).<sup>1</sup>

<sup>h</sup>Hypnotic general anesthetic that produces good sedation.

ATC: around-the-clock; BNZ: benzodiazepines; CNS: central nervous system; EMLA<sup>®</sup>: Eutectic Mixture of Local Anesthetics (lidocaine and prilocaine); IV: intravenous; LAs: local anesthetics; NO: nitrous oxide; NPO: nothing per os (by mouth); NSAIDs: nonsteroidal anti-inflammatory drugs, including aspirin; PO: per os (oral); PCA: patient-controlled analgesia; PRN: as needed; TD: transdermal.

**Table 35. Regional Anesthesia for Acute Pain Management**

Perioperative pain <sup>a</sup>	<ul style="list-style-type: none"> <li>• Epidural anesthesia with opioids or opioid plus local anesthesia mixture injected intermittently or infused continuously<sup>b</sup></li> <li>• Intrathecal opioids or opioid plus local anesthetics</li> <li>• Local neural blockade<sup>c</sup></li> <li>• Other regional anesthesia<sup>d</sup> techniques</li> </ul>
Trauma	<ul style="list-style-type: none"> <li>• Limited to local neural blockade<sup>c</sup> during emergency phase</li> <li>• Also includes epidural analgesia with opioids and/or local anesthetics during post-trauma healing phase, especially for regionalized pain<sup>e</sup></li> </ul>
Burns	<ul style="list-style-type: none"> <li>• Epidural analgesia with opioids and/or local anesthetics (only after closure of burn wound)</li> </ul>
Procedural	<ul style="list-style-type: none"> <li>• Includes local infiltration with local anesthetics</li> </ul>
Obstetrical pain <sup>f</sup>	<ul style="list-style-type: none"> <li>• Epidural analgesia<sup>g</sup> or spinal analgesia with local anesthetics (e.g., bupivacaine, ropivacaine) and/or opioid</li> <li>• Combined spinal-epidural techniques (combined spinal-epidural techniques)<sup>h</sup> with opioids</li> <li>• Epidural analgesia, spinal, or combined spinal-epidural techniques for Cesarean section</li> <li>• Tissue infiltration with local anesthetics</li> </ul>

Sources: References 1, 19-20, and 22-24.

<sup>a</sup>The American Society of Anesthesiologists defines acute pain in the perioperative setting as “pain that is present in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or a combination of disease-related and procedure-related sources.”<sup>19</sup> Thus, perioperative pain includes postoperative pain (i.e., pain that follows surgery).

<sup>b</sup>Good analgesia but risk of delayed-onset respiratory depression; requires careful monitoring for potential complications (e.g., abscess development, anesthesia of a nerve root at the site of catheter tip).<sup>1</sup> Addition of a local anesthetic has opioid-sparing effect and improves analgesia.

<sup>c</sup>Local neural blockade is by intermittent (e.g., intercostal nerve blockade with local anesthetics or cryoprobe) or continuous (infusion of local anesthetic through an interpleural catheter) methods.

<sup>d</sup>Other regional anesthesia techniques include: infiltration of incisions with local anesthetic.

<sup>e</sup>Useful when not contraindicated by sepsis, coagulopathy, or cardiorespiratory instability.<sup>1</sup> Must clear spine before using central conduction block or intraspinal opioids.<sup>23</sup>

<sup>f</sup>Goal of regional anesthesia in pregnant women is to provide adequate analgesia with as little block as possible.<sup>20</sup>

<sup>g</sup>Epidural anesthesia is preferred to spinal analgesia and parenteral opioids due to superior analgesia and decreased risk of maternal and/or fetal complications.<sup>20</sup> Epidural analgesia with opioids with a local anesthetic provides better analgesia than epidural anesthesia with local anesthetics alone but is associated with greater risk of complications.<sup>20</sup>

<sup>h</sup>Combined spinal-epidural techniques may provide rapid and effective analgesia for labor, but there is a higher risk of side effects.<sup>20</sup>

**Table 36. Nonpharmacologic Interventions for Acute Pain**

Pain Type or Source	Physical Methods <sup>a</sup>	Psychological Methods	Other
Acute illness	<ul style="list-style-type: none"> <li>• Vibration or cold for some HA; immobilization</li> </ul>	Patient education, relaxation, imagery, distraction	
Perioperative pain <sup>b</sup>	<ul style="list-style-type: none"> <li>• Exercise or immobilization</li> <li>• Massage</li> <li>• Application of heat or cold</li> <li>• Electroanalgesia (e.g., TENS)</li> </ul>	Patient education, relaxation, distraction, imagery, biofeedback, hypnosis	Acupuncture
Trauma	<ul style="list-style-type: none"> <li>• Rest, ice, compression, elevation (RICE)</li> <li>• Physical therapy (e.g., stretching, strengthening, thermal therapy, TENS, vibration)</li> </ul>	Relaxation, hypnosis, distraction, supportive psychotherapy, coping skills training	
Burns	<ul style="list-style-type: none"> <li>• Limb elevation</li> <li>• Minimize number of dressing changes</li> </ul>	Patient education, distraction, deep relaxation, imagery, hypnosis, operant conditioning	
Procedural	<ul style="list-style-type: none"> <li>• Application of cold (pre- and post-procedure)</li> <li>• Counterirritation methods (e.g., simple massage, scratching, pressure)</li> <li>• Rest or immobilization (post-procedure)</li> </ul>	Patient education, relaxation, distraction, imagery, music relaxation	
Obstetric		Patient education, relaxation breathing, distraction	

Sources: References 1, 18-19, and 21-27.

<sup>a</sup>Physical agents or modalities provide pain relief, improve physical function, and reduce fears associated with pain-related immobility or activity restriction.<sup>1</sup>

<sup>b</sup>The American Society of Anesthesiologists defines acute pain in the perioperative setting as “pain that is present in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or a combination of disease-related and procedure-related sources.”<sup>19</sup> Thus, perioperative pain includes postoperative pain (i.e., pain that follows surgery).

HA: headache; TENS: transcutaneous electrical nerve stimulation.

## 2. Therapeutic Strategies

### a. Multimodal therapy

As with acute pain, the literature and various CPGs support the use of multimodal therapy for chronic pain. In their 1997 Practice Guidelines for Chronic Pain Management, the American Society of Anesthesiologists (ASA) defines multimodal therapy as the “concomitant use of separate therapeutic interventions under the direction of a single practitioner to obtain additive beneficial effects or reduction of adverse effects.”<sup>2</sup>

Examples of multimodal therapy include use of:

- Medications from different classes (i.e., combination drug therapy)
- Rehabilitative therapies (e.g., physical therapy, occupational therapy) and medications
- Regional anesthesia (e.g., neural blockade) and medications.

### b. Interdisciplinary approach to rehabilitation

The literature<sup>31-32</sup> and various organizations (e.g., the Commission on Accreditation of Rehabilitation Facilities [CARF], the American Academy of Family Physicians [AAFP]) also support the use of an interdisciplinary rehabilitative approach to the management of chronic pain. This refers to a process in which health care professionals with disparate training collaborate to diagnose and treat patients suffering from difficult pain states. The Rehabilitation Accreditation Commission (also known as CARF) defines a chronic pain management program (CPMP) as [one that] “provides coordinated, goal-oriented, interdisciplinary team services to reduce pain, improve functioning, and decrease the dependence on the health care system of persons with chronic pain syndrome.”<sup>33-34</sup> Various reviews of program outcomes suggest that potential benefits of participation in a CPMP include reduced pain intensity, improved sense of control over the pain, physical reconditioning, lower use of opioids and health care resources, reduced health care costs, and increased employment.<sup>2,30-32,35-36</sup>

Essential functions of a CPMP include medical diagnosis, assessment of physical function, psychosocial assessment, pharmacologic therapy, physical rehabilitation, patient education, and appropriate psychological approaches (e.g., relaxation, biofeedback, coping skills training, psychotherapy).<sup>30,36</sup> In some patients, more

**Table 37. Interdisciplinary Management of CNCP: Examples of Interventions**

- Patient education: counseling about the pain, aggravating and alleviating factors, management strategies, lifestyle factors that may influence the pain (e.g., use of nicotine, alcohol).
- Physical rehabilitative approaches: physical therapy modalities for reconditioning (e.g., walking, stretching, exercises to improve strength and endurance, oscillatory movements)
- Other physical approaches: application of heat or cold, TENS, massage, acupuncture
- Occupational therapy: attention to proper body mechanics, resumption of normal levels of activities of daily living
- Pharmaceuticals: nonopioids, opioids, antidepressants, antiepileptic drugs, stimulants, antihistamines
- Regional anesthesia: nerve blocks (e.g., diagnostic, somatic, sympathetic, visceral, trigger point) and/or intraspinal analgesia (e.g., opioids, clonidine, baclofen, local anesthetics)
- Psychological approaches: relaxation training, hypnosis, biofeedback, coping skills, behavior modification, psychotherapy
- Surgery: neuroablation, neurolysis, microvascular decompression

Sources: References 2, 28, 30, and 36-37.

CNCP: chronic noncancer pain; TENS: transcutaneous electrical nerve stimulation.

invasive approaches (e.g., nerve blocks, trigger point or steroid injections, epidural or intrathecal analgesia, neurosurgical procedures) and/or intensive chronic pain rehabilitation are warranted. Team members represent a number of health care disciplines and include physicians (e.g., neurologists, psychiatrists, anesthesiologists, rheumatologists, neurosurgeons, physiatrists), nurses, pharmacists, case managers, social workers, physical therapists, occupational therapists, and vocational counselors.<sup>37</sup> Interventions are diverse, as summarized in Table 37.

## 3. Elements of Treatment

### a. Pharmacologic management

Although similarities exist, the pharmacologic management of CNCP differs from that for acute pain in some important ways.

Greater use of adjuvant analgesics: The greater use of adjuvant analgesics for chronic pain reflects, in part, the greater frequency of neuropathic pain and reduced responsiveness of such pain to traditional analgesics. The results of multiple placebo-controlled clinical trials and various CPGs<sup>2,28</sup> support the use of antidepres-

sants, antiepileptic drugs, and local anesthetics as first-line approaches to the treatment of chronic pain. The 1997 ASA CPGs for Chronic Pain Management state that membrane stabilizing agents, antidepressants, and NSAIDs “provide analgesic and health benefits” in patients with chronic pain.<sup>2</sup> The 2000 AAFP CPGs for the treatment of CNCP note that secondary benefits of antidepressants include improved sleep and the treatment of any associated depression or anxiety.<sup>28</sup> Similarly, the antiepileptic drug gabapentin improves sleep and mood, as well as pain and quality of life, in patients with some types of neuropathic pain.<sup>38-39</sup>

**More judicious use of opioids:** For many years, use of opioids to treat CNCP was considered ill-advised. This position reflected multiple fears and concerns, including the potential for iatrogenic addiction, declining efficacy, toxicities, and potential interference with optimal functioning (e.g., promotion of regression, reinforcement of pain behaviors, diversions, decreased motor and cognitive functioning).<sup>40</sup> However, a number of pain-related organizations and experts have expressed recent support for the judicious use of opioids in patients with chronic pain. For example, the American Academy of Pain Medicine and the American Pain Society recently issued a statement that supports the use of opioids in select patients with CNCP.<sup>41</sup> As with other medical interventions, such a decision must be based on careful consideration of the ratio of benefits to risks (e.g., toxicity, functional impairment, addiction).<sup>b,40</sup> Table 38 summarizes some recommendations regarding use of opioids in patients with CNCP.<sup>48</sup>

#### **b. Nonpharmacologic approaches**

Nonpharmacologic approaches play a key role in managing CNCP. Patient education is potentially the most critical therapy, as it is often essential for rehabilitation. Invalidism and family enabling may result from uncertainty or inaccurate information.<sup>30</sup> Reconditioning reduces pain, promotes physical and psychological rehabilitation, and empowers the patient. In addition to reducing emotional distress, psychological techniques (e.g., relaxation, biofeedback) can relax muscles and reduce autonomic nervous arousal. In its 2000 CPGs, the AAFP recom-

<sup>b</sup> Some studies have shown beneficial effects of long-term opioid therapy in carefully selected patients with CNCP, including reduced pain, improved performance, and enhanced quality of life.<sup>42-44</sup> However, clinicians should remain aware of the potential for opioid-induced hyperalgesia and/or analgesia without associated improvement in function in some patients.<sup>40,43,45-47</sup>

**Table 38. Recommendations for Opioid Therapy in Patients with Chronic Noncancer Pain**

**Before treatment:**

- Perform comprehensive assessment, including a pain history and assessment of the impact of the pain, a directed physical examination, a review of prior diagnostic study results or interventions, a drug history (i.e., past abuse), and an assessment of coexisting diseases or conditions.
- Consider obtaining a second opinion from a physician or psychologist with expertise in pain management and use of interdisciplinary team.
- Optimize nonpharmacologic and nonopioid therapies.
- Inform patient of potential risks of use of controlled substances, including addiction (informed consent)
- Agree on issues including how drugs will be provided, acceptable number of rescue doses, pharmacy to be used for prescription refills, and the follow-up interval.

**During treatment:**

- Administer opioids primarily via oral or transdermal routes, using long-acting medications when possible
- Use a fixed dosed (“around-the-clock”) regimen.
- Perform careful drug titration, balancing analgesia against side effects.
- Continue efforts to improve analgesia via complementary approaches (e.g., behavioral approaches, formal rehabilitation program, other medications).
- Consider use of hospitalization for pain that is not treated by transient, small dose increments.
- Monitor for evidence of drug hoarding, unauthorized dose increases, and other aberrant behavior. Reconsider therapy in the occurrence of such behaviors.
- Perform frequent follow-up evaluation to monitor analgesia, side effects, functional status, quality of life, and any evidence of medication misuse.
- Consider use of self-report instruments (e.g., pain diary).
- Carefully document the overall pain management treatment plan and include the reason for opioid prescribing, any consultations received, and results of periodic review of the patient’s status.

Sources: References 29, 41, and 48.

mends the use of nonpharmacologic interventions (i.e., patient education, physical therapy [PT], occupational therapy [OT], treatment of coexisting psychological disorders) in the management of all patients with CNCP.<sup>28</sup>

## **4. Management of Some Common Types of Chronic Noncancer Pain**

There are many types of CNCP. This section provides a brief overview through the summary tables of a few common types. In addition to their relatively high prevalence, these pain types were selected because effective treatments and/or evidence of inadequate management

exist. Tables 39 to 42 summarize management approaches, including systemic administration of medications (Tables 39 and 40), interventional techniques (Table 41), and nonpharmacologic strategies (Table 42), for the following types of CNCP:

**Arthritis pain**

Arthritis pain can result from more than 100 rheumatic diseases, which cause pain, stiffness, and swelling of joints as well as damage to sup-

porting structures.<sup>55</sup> Osteoarthritis (OA) and rheumatoid arthritis (RA) are the most common types of arthritis. OA (often referred to as degenerative joint disease) is characterized by a progressive loss of articular (joint) cartilage, mostly affecting weight-bearing and frequently used joints (e.g., hip, knee).<sup>53</sup> It often manifests as deep aching pain, stiffness, and limited range of motion. RA is a common inflammatory arthritis of unknown etiology that affects multiple joints.<sup>53</sup> RA manifests clinically as aching,

**Table 39. Pharmacologic Management for Chronic Noncancer Pain: Selected Examples**

Type of Pain	Nonopioids	Opioids	Adjuvant Analgesics and Disease-Specific Drugs	Comments
Arthritis pain	Acetaminophen NSAIDs Selective COX-2 inhibitors <sup>a</sup>	Short-term, mild opioids for flare-ups	Corticosteroids (oral for RA, injections for OA and RA) Topical capsaicin DMARDs <sup>b</sup> (e.g., MTX, DP, gold salts, AZA, SSZ, HCQ) BRM <sup>c</sup> (e.g., entanercept, inflixmab)	Select NSAID based on dosing, efficacy, tolerance, costs, and patient preference Monitor closely for NSAID side effects Opioids are appropriate for long-term treatment in selected patients
Low back pain	Acetaminophen NSAIDs Selective COX-2 inhibitors	Short-term opioids for mild-to-moderate flare-ups	TCAs (e.g., amitriptyline, nortriptyline) AEDs Muscle relaxants (short term)	Opioids are appropriate for long-term treatment in selected patients
Fibromyalgia	Acetaminophen NSAIDs Selective COX-2 inhibitors	Opioids (occasional use for “flares”) Tramadol	TCAs (e.g., amitriptyline, nortriptyline, doxepin) Muscle relaxants (short-term) (e.g., cyclobenzaprine)	Tramadol may have less potential for abuse
Sickle cell disease pain	Acetaminophen, NSAIDs	Short-acting <sup>d</sup> or long-acting opioids	Sedatives Anxiolytics	Use short-acting opioids for short-term treatment and longer-acting opioids for longer treatment
Peripheral neuropathy (e.g., PDN, PHN)	Acetaminophen NSAIDs	Opioids (short-term only)	TCAs (e.g., amitriptyline) AEDs (e.g., gabapentin, carbamazepine, valproate) Topical agents (e.g., lidocaine patch, capsaicin) Local anesthetics (e.g., lidocaine, mexiletine) <sup>e</sup> (rarely used) NMDA antagonists (e.g., ketamine <sup>f</sup> ) (rarely used)	AEDs, TCAs, and topical local anesthetics are first-line treatments Lidoderm® is first FDA-approved treatment for PHN Placebo-controlled trials found TCAs and gabapentin equally effective for treatment of PDN and PHN NSAIDs are rarely effective Try opioids as last resort

Sources: References 17, 38-39, and 49-70.

<sup>a</sup>Initial recommended treatment for OA includes acetaminophen and nonpharmacologic management (e.g., education, exercises, joint protection).<sup>49-51</sup> Patients who need additional pain relief and symptom control should receive low- or full-dose NSAIDs, topical capsaicin, or corticosteroids, as indicated. The initial drug treatment of RA usually involves NSAIDs.<sup>52</sup> Patients with inadequate response to NSAIDs may require DMARDs.<sup>52</sup>

<sup>b</sup>DMARDs are associated with multiple toxicities; therefore, they require careful balancing of the risks and benefits and close patient monitoring.<sup>52</sup>

<sup>c</sup>Biological response modifiers are used to reduce symptoms in some patients with RA.<sup>53</sup>

<sup>d</sup>Morphine or hydromorphone is preferred to meperidine due to potential toxicity of the meperidine metabolite.<sup>54</sup>

<sup>e</sup>These medications are contraindicated in patients with cardiac conduction abnormalities, left ventricular dysfunction, or severe liver or renal disease. Topical lidocaine (Lidoderm®) is not associated with the toxicities seen with systemic administration of lidocaine.

<sup>f</sup>NMDA antagonists are effective but are used very rarely due to severe central nervous system side effects.

AEDs: antiepileptic drugs; AZA: azathioprine; BRM: biological response modifiers; COX-2 inhibitors: cyclooxygenase-2 inhibitors; DMARDs: disease-modifying anti-rheumatic drugs; DP: D-penicillamine; FDA: Food and Drug Administration; HCQ: hydroxychloroquine; MTX: methotrexate; NMDA: N-methyl-D-aspartate; NSAIDs: nonsteroidal anti-inflammatory drugs; OA: osteoarthritis; PDN: painful diabetic neuropathy; PHN: postherpetic neuralgia; RA: rheumatoid arthritis; SSZ: sulfasalazine; TCAs: tricyclic antidepressants.

burning joint pain (often with swelling and redness), joint enlargement, joint and muscle stiffness, and various constitutional symptoms (e.g., fatigue, weakness, fever, weight loss). OA affects about 16 million, mostly older, Americans, whereas approximately 2.1 million Americans suffer from RA.<sup>55</sup> Approaches to management of arthritis pain include medications (e.g., disease-modifying anti-rheumatic drugs, nonsteroidal anti-inflammatory drugs, acetaminophen), physical rehabilitative approaches (e.g., exercises, OT, PT, massage, heat and cold, electroanalgesia), psychological approaches, and in some cases, acupuncture or surgery (Tables 39, 41, and 42).<sup>49-52,55, 90</sup>

**b. Chronic low back pain**

Chronic low back pain (LBP) is the commonest cause of disability in industrialized nations. About four out of five Americans will experience back pain at some point in their lives.<sup>86</sup> Whereas (acute) back pain resolves within 4-6 weeks in 90% of patients,<sup>59-60</sup> the pain persists

in others. LBP has many causes (e.g., trauma, musculoskeletal spasm, arthritis, herniated disc with nerve compression, myofascial pain, ankylosing spondylitis, spinal stenosis, arachnoiditis, cancer, kidney disease, obesity) but, in most cases, no specific cause can be identified.<sup>59-60</sup> Management options for chronic LBP include medications, psychological approaches (education, “back school,” psychotherapy, biofeedback), exercises, other physical approaches (e.g., OT, PT, electroanalgesia, heat and cold) and, in some cases, acupuncture, manipulation, or surgery (Tables 39, 41, and 42).<sup>28,58,60-61</sup>

**c. Fibromyalgia**

Fibromyalgia is a chronic syndrome that manifests as widespread musculoskeletal pain and multiple “tender points” localized to areas in the neck, spine, shoulders, and hips.<sup>64</sup> In addition to chronic pain with acute flares, patients often experience sleep disturbances, morning stiffness, anxiety, and irritability.<sup>63-64</sup> Fibromyalgia is diagnosed based on criteria established by the

**Table 40. Pharmacologic Management of Migraine and Other Types of Headache**

Headache Type	Prophylaxis	Abortive	Comments
Migraine	AEDs (e.g., divalproex sodium <sup>a</sup> , gabapentin) BBs (e.g., propranolol, timolol) <sup>a</sup> CCBs (e.g., verapamil, nimodipine) TCAs (e.g., amitriptyline) NSAIDs (e.g., ASA, flurbiprofen) Estradiol <sup>b</sup> Methysergide <sup>c</sup>	NSAIDs (e.g., ASA, ibuprofen, naproxen, diclofenac, flurbiprofen, piroxicam) Opioids, including butorphanol <sup>d</sup> Combination treatment: • Acetaminophen plus ASA plus caffeine • ASA plus butalbital plus caffeine <sup>e</sup> • Acetaminophen plus codeine Dihydroergotamine <sup>f</sup> : (intranasal, SC, IV) Selective 5HT <sub>1B/1D</sub> receptor agonists (“triptans”) • Rizatriptan (PO) • Zolmitriptan (PO) • Sumatriptan (PO, SC, or intranasal) • Almotriptan (PO) • Eletriptan (PO) • Frovatriptan (PO) • Naratriptan (PO)	Acetaminophen plus ASA plus caffeine considered first-line treatment First-choice NSAIDs are ASA, ibuprofen, and naproxen; others also are effective Tryptans are effective and appropriate initial choice for patient with mild to severe HA and no contraindications
Tension	TCAs (e.g., amitriptyline, doxepin)	Acetaminophen NSAIDs	
Cluster	CCBs (e.g., verapamil) Corticosteroids Methysergide AEDs (e.g., divalproex sodium)	Ergotamine Dihydroergotamine Inhalation of oxygen	

Sources: References 71-80.

<sup>a</sup>Divalproex sodium, timolol, and propranolol are indicated for migraine prophylaxis.

<sup>b</sup>Estradiol administered premenstrually can prevent migraine in women who have migraine related to menses.<sup>71-74</sup>

<sup>c</sup>Methysergide is effective but of limited utility due to the risk of complications (e.g., retroperitoneal or retropleural fibrosis).<sup>71-74</sup>

<sup>d</sup>Intranasal butorphanol is effective for migraine<sup>71-74</sup> and is good rescue therapy.<sup>75</sup> IV opioids also may be appropriate for rescue therapy.<sup>71-74</sup>

<sup>e</sup>This combination requires careful monitoring due to the potential for abuse of butalbital.<sup>71-74</sup>

<sup>f</sup>Consider dihydroergotamine for headaches that have not responded to other first-line treatments or patients who cannot take PO.

5-HT: 5-hydroxytryptamine; AEDs: antiepileptic drugs; ASA: aspirin; BBs: beta blockers; CCBs: calcium channel blockers; HA: headache; IV: intravenous; NSAIDs: nonsteroidal anti-inflammatory drugs; PO: per os (oral); SC: subcutaneous; TCAs: tricyclic antidepressants.

**Table 41. Regional Anesthesia for Chronic Noncancer Pain**

Pain Type	Method
Arthritis pain	Intra-articular injection <sup>a</sup> of corticosteroids (e.g., methylprednisolone) Intra-articular injections of sodium hyaluronate <sup>b</sup>
Low back pain	Facet joint injections with local anesthetic <sup>c</sup> Sciatic nerve block with local anesthetic for backache due to sciatica Epidural steroid injections (e.g., methylprednisolone), often with local anesthetic (e.g., lidocaine) <sup>d</sup>
Headache and migraine	Occipital nerve block with local anesthetic for occipital headache

Sources: References 51 and 83-84.

<sup>a</sup>Corticosteroid injections are used for the knees and hips and are limited to 3-4 per year.<sup>51</sup>

<sup>b</sup>These injections are approved for the knee, and studies have shown mixed results in regard to efficacy.<sup>81-82</sup>

<sup>c</sup>Controversy exists over the efficacy of therapeutic facet blocks but they are useful diagnostic blocks.<sup>83</sup>

<sup>d</sup>Controversy exists over the efficacy of epidural steroids for low back pain. Frequent epidural steroids can suppress hypothalamic-pituitary-adrenal axis function. Also, there is the potential for complications due to the epidural approach (e.g., hematoma, infection), the steroids (e.g., hypertension, hyperglycemia), or local anesthetic (heart arrhythmias).<sup>84</sup>

American College of Rheumatology.<sup>64</sup> Its cause is unknown, but theories about its etiology include trauma and infection.<sup>63</sup> About 3 to 6 million Americans suffer from fibromyalgia, mostly women of child-bearing age.<sup>64</sup> Fibromyalgia generally is managed with medications, psychological approaches (education, relaxation therapy, hypnosis, psychotherapy), aerobic exercise, other physical approaches (e.g., OT, PT, electroanalgesia, heat and cold, vibration), and in some cases, acupuncture or manipulation (Tables 39 and 42).<sup>56,63,91</sup>

#### d. Sickle cell disease pain

Sickle cell disease (SCD) refers to a group of inherited blood disorders in which an abnormal form of hemoglobin, hemoglobin S, is the predominant form of hemoglobin. Chronic hemolytic anemia and vaso-occlusive events are its major pathologic features, and the primary clinical manifestation of SCD is pain.<sup>54</sup> Deoxygenated hemoglobin S causes red blood cells to sickle (change shape) at sites of low oxygen availability, stick to the lining of small blood vessels, and occlude (plug) them. Along with inflammation, these vaso-occlusive events cause pain. Other

causes of pain in these patients include infection, infarction, and the accumulation of blood in various organs. According to the 1999 American Pain Society *Guideline for the Management of Acute and Chronic Pain in Sickle Cell Disease*, SCD pain may be acute, chronic, or of mixed duration and attributable to the disease or its treatment.<sup>54</sup> Sickle cell pain is managed with medications, physical approaches (e.g., adequate hydration, applied heat, PT, massage, ultrasound, electroanalgesia) and psychological approaches (e.g., deep breathing, relaxation, biofeedback) appropriate for acute and chronic pain management (Tables 39 and 42).<sup>54,66</sup> SCD is also managed with a various treatments (e.g., transfusions) that reduce sickling.

#### e. Peripheral neuropathy

Peripheral neuropathy (PN) is a disorder caused by damage to one or more peripheral nerve(s). Its incidence is unknown, but it is a common feature of many systemic diseases.<sup>89</sup> Diabetes and alcohol are the most common causes of PN in developed countries.<sup>89</sup> Other causes include other endocrine disorders and nutritional deficiencies, infection (e.g., post herpetic neuralgia, human immunodeficiency virus-related neuropathy), hereditary conditions, trauma, nerve entrapment (e.g., carpal tunnel syndrome), collagen-vascular disorders, toxic agents, and cancer.<sup>68</sup> Yet, in many cases, the cause of the neuropathy is unknown.<sup>67,89</sup> Clinically, PN often manifests as weakness, numbness, paresthesias (abnormal sensations, such as pins and needles, burning, tingling, or prickling), and pain in the hands, arms, legs, or feet.<sup>67</sup> Treatment of the PN depends on the underlying cause and includes medications, physical approaches (e.g., PT, electroanalgesia, cold and heat), psychological approaches (including education about management of the underlying condition), and in some cases, surgery (Tables 39 and 42).<sup>67-68</sup>

#### f. Headache

Headache includes migraine with and without aura, tension-type, and cluster headaches. Headache disorders may be acute, chronic, or both, but are classified as chronic for the purpose of this discussion. Symptoms, triggers, and treatment vary with headache type. Migraine without aura (formerly common migraine) is an idiopathic chronic headache disorder characterized by a unilateral, pulsating headache of moderate to severe intensity. The headache ranges in

**Table 42. Nonpharmacologic Interventions for Chronic Noncancer Pain**

Type of Pain	Surgical	Other Physical Methods	Psychological Methods	Other
Arthritis pain	Includes arthroscopy and TJR for OA <sup>a</sup> and synovectomy, osteotomy, spinal fusion, and arthroscopy and TJR for RA	TENS, applied heat or cold, low-impact aerobic and ROM exercises, joint protection (splint or brace), massage, PT, OT	PE (rest, exercise, nutrition) and social support	Acupuncture Nutritional supplements <sup>b</sup>
Low back pain	For example, laminectomy, discectomy, lumbar fusion, lumbar stabilization <sup>c</sup>	SCS, cryoanalgesia, radiofrequency coagulation, exercise (for strength and flexibility), PT, OT, TENS, braces, vibration	PE, “back school,” biofeedback, psychotherapy	Acupuncture Manipulation therapy
Fibromyalgia		Applied heat, massage, gentle aerobic exercise and stretching, attention to proper posture, PT, TENS, vibration	PE, relaxation, hypnosis, psychotherapy	Acupuncture <sup>d</sup>
Sickle cell disease		Careful hydration, applied heat, massage, ultrasound, PT, TENS	PE, deep breathing and relaxation techniques, distraction, imagery, hypnosis, meditation, biofeedback, psychotherapy	Acupuncture/ acupressure
Peripheral neuropathy (e.g., PDN, PHN)	For example, decompressive surgery for nerve entrapment, vascular surgery for vascular insufficiency	Good skin care and foot care, PT, TENS, possibly SCS, applied heat or cold, massage	PE (e.g., need for tight blood glucose control, good skin and foot care), relaxation, biofeedback, psychotherapy	
Migraine and other types of headache		Application of heat or cold, exercise (prophylaxis), vibration	PE (triggers, medication compliance), relaxation and biofeedback (thermal, EMG training) for headache prophylaxis	

Sources: References 49-52, 54-56, 58, 60, 65, 67-68, 86, and 88-89.

<sup>a</sup>Surgery for OA is for patients with moderate to severe pain and functional disability who have not responded to medical therapy.<sup>5</sup> Total joint arthroplasty usually is associated with a good outcome and improved quality of life.<sup>85</sup>

<sup>b</sup>Not currently recommended due to lack of data. Trials for some supplements (glucosamine and chondroitin sulfate) are underway.<sup>51</sup>

<sup>c</sup>The Food and Drug Administration has approved medical devices such as the Intervertebral Body Fusion device, Anterior Spinal Implant, and Posterior Spinal Implant to treat degenerative disk disease and stabilize and fuse the spine.<sup>86</sup>

<sup>d</sup>Usually reserved for patients with fibromyalgia syndrome/myofascial pain syndrome who do not respond to other measures.<sup>56,87</sup>

EMG: electromyography; OA: osteoarthritis; OT: occupational therapy; PDN: painful diabetic neuropathy; PE: patient education; PHN: postherpetic neuralgia; PT: physical therapy; RA: rheumatoid arthritis; ROM: range of motion; SCS: spinal cord stimulation; TENS: transcutaneous electrical nerve stimulation; TJR: total joint replacement.

duration from 4 to 72 hours and is accompanied by various symptoms (e.g., photophobia, nausea, vomiting).<sup>79</sup> Migraine with aura (formerly classic migraine) is similar but is preceded by transient neurologic symptoms (e.g., visual disturbances, aphasia, hemiparesis). Tension-type headache refers to a bilateral pressing or tightening type of headache of mild to moderate severity, which may be episodic or chronic.<sup>79</sup> Cluster headaches are unilateral headaches usually located around

the eye (periorbital). Patients may experience excruciating boring, knife-like, or burning pain, tearing, and rhinorrhea. The attacks are relatively short but may recur numerous times a day.<sup>79</sup> Treatment of migraine includes medications (abortive and prophylactic), physical approaches (e.g., cold and heat), psychological approaches (e.g., relaxation, biofeedback), and in some cases, regional anesthesia (Tables 40 to 42).<sup>71-78</sup>





---

Section V:

# Strategies to Improve Pain Management

## A. CLINICAL PRACTICE GUIDELINES

### 1. Which Practice Guidelines Apply to Pain Management?

The Agency for Health Care Policy and Research (AHCPR)<sup>a</sup> introduced the first clinical practice guideline (CPG) for pain management in 1992.<sup>1</sup> Other groups, including the American Pain Society (APS), the American Society of Anesthesiologists (ASA), and the American Academy of Family Physicians (AAFP), have since produced an assortment of CPGs relevant to the management of acute and chronic pain (Table 43). In addition, numerous disciplines have developed CPGs relevant to specific types of pain or the management of conditions with a painful component (Table 44).

### 2. Are Clinicians Adopting and Using Clinical Practice Guidelines?

Pain management remains inadequate, despite the availability of CPGs. To clarify the basis of this problem, various studies have explored clinicians' adoption and use of CPGs or the effects of a specific CPG initiative on clinical practice. Table 45 summarizes some of these studies. Overall, these data suggest that, despite some improvements, inconsistent assessment and inappropriate treatment of pain (e.g., intramuscular injections) persist.<sup>41,45</sup> Furthermore, administrative mandates rather than education alone appear necessary to change practice patterns.<sup>48</sup>

<sup>a</sup> The Agency for Health Care Policy and Research is now the Agency for Healthcare Research and Quality.

## B. STANDARDS AND OUTCOME MEASURES

### 1. JCAHO Standards

Various groups (e.g., the Joint Commission on Accreditation of Healthcare Organizations [JCAHO], APS, ASA) have proposed standards, outcome measures, and other initiatives in efforts to improve pain management (Table 46). Outcome measures complement CPGs because they help quantify the effects of a given therapy on the patient's health and well-being. Combined with other data (e.g., measures of guideline adherence), health care organizations

**Table 43. Examples of Practice Guidelines for Management of Acute or Chronic Pain**

Year <sup>a</sup>	Source	Title
1992	AHCPR <sup>b</sup>	Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1 (Publication No. 92-0032)
1993	AHCPR <sup>b</sup>	Acute Pain Management In Adults: Operative Procedures Quick Reference Guide for Clinicians No. 1a (Publication No. 92-0019)
1995 (amended 2003)	ASA	Practice guidelines for acute pain management in the perioperative setting
1996 (revised 2002)	ASA	Practice guidelines for sedation and analgesia by non-anesthesiologists
1997	ASA	Practice guidelines for chronic pain management
1998 (revised 2002)	AGS	The management of persistent pain in older persons
1999	APS	Principles of analgesic use in the treatment of acute pain and cancer pain
1999	AMDA	Chronic pain management in the long-term care setting
2000	AAFP	Treatment of nonmalignant chronic pain
2000 (revised 2004)	ICSI	Assessment and management of acute pain

Sources: References 1-11.

<sup>a</sup>Practice guidelines are continually updated, so please check with the source listed for the most up-to-date version.

<sup>b</sup>The Agency for Health Care Policy and Research is now the Agency for Healthcare Research and Quality.

AAFP: American Academy of Family Physicians; AGS: American Geriatrics Society; AHCPR: Agency for Health Care Policy and Research; AMDA: American Medical Directors Association; APS: American Pain Society; ASA: American Society of Anesthesiologists; ICSI: Institute for Clinical Systems Improvement.

**Table 44. Examples of Practice Guidelines for the Management of Specific Types of Pain or Conditions With Painful Components**

Year <sup>a</sup> Released	Year Revised	Source	Title
1994		AHCPR <sup>b</sup>	Clinical Practice Guideline: Management of Cancer Pain (Publication No. 94-0592)
1994		AHCPR <sup>b</sup>	Acute Low Back Problems in Adults Guideline No. 14 (Publication No. 95-0642)
1995	2000	ACR	Guidelines for the medical management of osteoarthritis Part I. Osteoarthritis of the hip
1995	2000	ACR	Guidelines for the medical management of osteoarthritis Part II. Osteoarthritis of the knee
1996	2002	ACR	Guidelines for the management of rheumatoid arthritis
1996		ASA	Practice guidelines for cancer pain management
1997		NIH	Acupuncture. NIH Consensus Statement
1999	2002 & 2004	ICSI	Adult low back pain
1999		ASA	Practice guidelines for obstetrical anesthesia
1999		AAOS	Clinical guideline on hip pain
1999	2003	AAOS	Clinical guideline on knee pain
1999		AAOS	Clinical guideline on wrist pain
1999		APS	Guideline for the management of acute and chronic pain in sickle cell disease
1999, 2000		AAN	Evidence-based guidelines for migraine headache (series)
2000		AAFP	Guidelines on migraine (series)
2000		AAFP	Osteoarthritis: current concepts in diagnosis and management
2000		AAFP	Management of pain in sickle cell disease
2000		ICSI	Migraine headache
2000	2004	ICSI	Diagnosis and treatment of adult degenerative joint disease (DJD) of the knee
2002		APS	Guideline for management of pain in osteoarthritis, rheumatoid arthritis, and juvenile chronic arthritis
2003		SNM	Procedure guideline for palliative treatment of painful bone metastases
2003	2005	ASIPP	Management of chronic spinal pain
2004		ICSI	Diagnosis and treatment of headache
2004		AAN	Treatment of migraine headache in children and adolescents
2004		AAN	Treatment of postherpetic neuralgia
2004		USHGC	Inpatient treatment of headache
2005		APS	Management of fibromyalgia syndrome pain in adults and children
2005		AAP	Chronic abdominal pain in children
2005		USPSTF	Preventing low back pain in adults

Sources: References 12-39h.

<sup>a</sup>Practice guidelines are continually updated, so please check with the source listed for the most up-to-date version.

<sup>b</sup>The Agency for Health Care Policy and Research is now the Agency for Healthcare Research and Quality.

AAFP: American Academy of Family Physicians; AAN: American Academy of Neurology; AAOS: American Academy of Orthopaedic Surgeons; AAP: American Academy of Pediatrics; ACR: American College of Rheumatology; AHCPR: Agency for Health Care Policy and Research; ASA: American Society of Anesthesiologists; ASIPP: American Society of Interventional Pain Physicians; ICSI: Institute for Clinical Systems Improvement; NIH: National Institutes of Health; SNM: Society of Nuclear Medicine; USHGC: US Headache Guidelines Consortium; USPSTF: US Preventive Services Task Force.

can use outcome data to evaluate and optimize provider performance. Standards provide a clear definition of what appropriate care entails; thus, they also improve quality of care.

Of these strategies, the recently introduced JCAHO standards for pain management have attracted the most attention. The standards clearly outline appropriate pain management practices for ambulatory care facilities, behavioral health care facilities, health care networks, home care,

hospitals, long-term care organizations, long-term care pharmacies, and managed behavioral health care organizations seeking accreditation.<sup>49</sup> These new standards are available on the World Wide Web (<http://www.jcaho.org>), and the second monograph in this series discusses these standards in greater detail. Briefly, the standards call upon organizations and facilities to:

- Recognize the right of patients to appropriate assessment and management of pain

**Table 45. Examples of Studies of Guideline Adherence and Interventions**

Source	Purpose	Methods	Findings and Conclusions
Pellegrini et al, 1999	Assess compliance with AHCPR guidelines in prescribing meperidine for obstetrical patients	Review of 300 charts of obstetric patients	Of 157 obstetrical patients receiving meperidine, 124 (79.8%) were not treated in accordance with AHCPR guidelines. The most frequent conflicts with the guidelines were suboptimal dosing and the treatment of chronic pain.
Carr et al, 1998	Assess compliance with AHCPR and ASA guidelines	National survey of pain in perioperative patients	Overall adherence was excellent except for continuing frequent intramuscular administration of opioids and infrequent use of nonpharmacologic pain management methods
Data Strategic Benchmarks, 1999	Assess compliance with AHCPR guidelines for management of postoperative pain	Review of records from multiple Wisconsin hospitals	Data from a multi-hospital study shows low compliance with pain management protocols for postoperative pain.
Cleeland et al, 1994	Assess compliance with WHO analgesic guidelines in managing cancer pain	Survey of 1308 outpatients with metastatic cancer treated at 54 sites affiliated with ECOG	42% of patients reported receiving insufficient analgesics; inadequate pain control was higher among some groups (e.g., racial minorities, women, elderly).
Cleeland et al, 1997	Assess compliance with guideline-recommended analgesic prescriptions for cancer in clinic setting	Survey of minority cancer patients	65% of minority cancer patients did not receive guideline-recommended analgesic prescriptions compared with 50% of non-minority patients.
Stratis Health, 1997	Assess compliance with AHCPR and American Pain Society guidelines for assessing cancer pain	Review of records for 271 cancer patients treated in Minnesota hospitals	Whereas 93% of the hospitals had documented some form of the patient's initial self-assessment of pain, only 26% used effective means of communicating pain intensity. Pain reassessment was also inconsistent.
Rischer and Childress, 1996	Assess whether the implementation of an AHCPR guideline-based action plan would improve pain and satisfaction among cancer patients	Chart audits at seven acute care hospitals in Utah before and after implementation	Process measures of care showed improved compliance with guidelines for managing cancer pain post-intervention; however, investigators concluded that "more needed to be done to prevent patient suffering."
Du Pen et al, 1999	Assess whether the implementation of an AHCPR guideline-based treatment algorithm for cancer pain would improve pain management in the community setting	Comparison of pain and symptom management in 81 cancer outpatients treated according to algorithm or standard-practice (control)	Cancer patients in the treatment algorithm group experienced a significant reduction in usual pain intensity compared with controls. The investigators concluded that comprehensive pain assessment and evidence-based analgesic decision-making processes enhance usual pain outcomes.
Harwood et al, 1997	Assess whether an AHCPR guideline-based educational program would improve the assessment of new low back pain by physicians	Compliance with the assessment protocol was measured by computer-based surveillance; the educational program included group and individual sessions, with extensive follow-up	An administrative mandate to change, but not the educational program alone, resulted in a significant increase in physician compliance in completing a standardized examination (assessment) for low back pain.

Sources: References 40-48.

AHCPR: Agency for Health Care Policy and Research (now the Agency for Health Care Research and Quality); ASA: American Society of Anesthesiologists; ECOG: Eastern Cooperative Oncology Group; WHO: World Health Organization.

- Screen for the presence and assess the nature and intensity of pain in all patients
- Record the results of the assessment in a way that facilitates regular reassessment and follow-up
- Determine and ensure staff competency in pain assessment and management (e.g., provide education), and address pain assessment and management in the orientation of all new clinical staff
- Establish policies and procedures that support the appropriate prescribing or ordering of pain medications
- Ensure that pain does not interfere with a patient's participation in rehabilitation
- Educate patients and their families about the importance of effective pain management
- Address patient needs for symptom management in the discharge planning process
- Incorporate pain management into performance review activities (i.e., establish a

**Table 46. Examples of New Outcome Measures, Standards, and Initiatives Related to Pain Management**

Organization	What Is Being Done	Purpose
ASA Committee on Pain Management	Recent development of pain outcome assessment questionnaire called the “ASA Nine”; this questionnaire considers nine items (domains) in assessing the efficacy of pain therapy	To measure outcomes in patients receiving pain therapy from anesthesiologists
APS	Pain as the 5th Vital Sign initiative (i.e., measure pain as a fifth vital sign with each evaluation of the standard four vital signs [i.e., temperature, pulse, respiration, and blood pressure])	Pain management improvement strategy directed at raising clinician awareness of need to assess pain regularly
APS	Alteration of WHO analgesic ladder	To make WHO ladder a more appropriate form of guidance, which recognizes that pain should be assessed for severity and treated with adequate analgesia in a timely manner
VHA National Pain Management Strategy	Initiative calling for a series of assessments to be performed by clinicians, including regular assessment of pain intensity with the NRS	To prevent pain and suffering in individuals receiving care in the VHA system
HCFA	Current evaluation of outcome measures to be used by hospice workers for assessing patient comfort during the dying process	To improve the quality of pain management at end of life for Medicare and Medicaid beneficiaries
HCFA	Recent identification of pain management at the end of life as a PRO program priority	Proposed project will implement an intervention to increase quality of care with respect to pain management and comfort in a population and setting where there is a demonstrated need <sup>a</sup>
JCAHO	Inclusion of new standards for pain assessment and management in JCAHO standards	To provide standards of care to be followed by ambulatory care facilities, behavioral health care facilities, health care networks, home care, hospitals, long-term care organizations, long-term care pharmacies, and managed behavioral health care organizations
NCQA	Involved in developing outcome measures related to pain management	Advance assessment of pain outcomes

<sup>a</sup>A population with a “demonstrated need” includes patients with cancer, congestive heart failure, chronic obstructive pulmonary disease, human immunodeficiency virus infection, acquired immunodeficiency syndrome, diabetes, end-stage renal disease, or another progressive illness.

APS: American Pain Society; ASA: American Society of Anesthesiologists; HCFA: Health Care Financing Administration; JCAHO: Joint Commission on Accreditation of Healthcare Organizations; NCQA: National Committee for Quality Assurance; NRS: Numeric Rating Scale; PRO: peer-reviewed organization; VHA: Veteran’s Healthcare Administration; WHO: World Health Organization

means of collecting data to monitor the appropriateness and effectiveness of pain management).

## 2. Institutional Commitment to Pain Management

Whereas the new JCAHO standards tell organizations what needs to occur in the assessment and management of pain, they do not tell organizations how to do it. Because education alone does not change practice patterns, health care organizations and institutions need to support system changes to improve pain manage-

ment and comply with the new JCAHO standards. That is, in addition to providing staff with practical clinical resources for pain management, health care organizations and institutions need to make pain “visible” and establish mechanisms to ensure accountability for pain control.<sup>50</sup> The book *Building an Institutional Commitment to Pain Management: Wisconsin Resource Manual* describes key steps to “institutionalizing” effective pain management, as summarized in Table 47.<sup>50</sup> In addition, the second monograph in this series reviews organizational performance measurement and improvement related to pain management to facilitate organizational initiatives.

**Table 47. Building an Institutional Commitment to Pain Management**

- Develop an interdisciplinary work group to promote practice change and collaborative practice. At a minimum, this work group should consist of representatives (clinicians, administrators) from medicine, nursing, and pharmacy, with those from other disciplines (e.g., OT, PT, RT, social work, pastoral care) when possible. Levels of experience should range from experts to novice.
- Analyze current pain management issues and practices in the health care setting, with the goal of continuous quality improvement. Plan a needs assessment to collect information about the quality of pain management and to identify causes of inadequate pain management. Sources of data include systematic observation of current practice, patient and staff surveys, medical record audits, and drug utilization reviews.
- Articulate and implement a standard for pain assessment and documentation to ensure the prompt recognition, documentation, and treatment of pain. This standard should define:
  - 1) how, when, and by whom pain should be assessed;
  - 2) where the results should be documented;
  - 3) methods of communicating this information among caregivers; and
  - 4) explicit conditions for interventions directed at relieving pain.
- Establish explicit policies and procedures to guide the use of specialized techniques for administering analgesics (e.g., intraspinal and intravenous analgesia and anesthesia, inhalational therapy, conscious or deep sedation).
- Establish accountability for quality pain management. This should include clearly defining caregiver responsibilities in pain management and embedding accountability for pain management in existing systems (e.g., practice standards, position descriptions, policies and procedures, competency statements, performance reviews).
- Provide readily available information about pharmacologic and nonpharmacologic interventions to clinicians to facilitate planning of care (e.g., order writing, interpretation and implementation of physician orders). This information can be presented in a variety of formats including clinical practice guidelines and pathways, decision or treatment algorithms, protocols, pocket reference guides, and computer help screens.
- Promise patients a prompt response to their reports of pain. According to the APS guidelines for quality improvement of pain management, all patients at risk for pain should be informed that: 1) effective pain relief is important to treatment, 2) their report of pain is essential, and 3) staff will promptly respond to patient requests for pain treatment.<sup>51</sup> Therefore, patients and their families should be provided appropriate educational materials that address important aspects of pain assessment and management (e.g., the importance of controlling pain, the use of pain rating scales to report pain intensity, how to establish realistic pain relief goals, pharmacologic and non-pharmacologic interventions for pain)
- Provide education about pain management to staff. This education may be provided in a variety of formats, including orientation and continuing education programs; rounds, lectures, and case conferences; self-directed learning packages, case studies, and interactive techniques (e.g., brainstorming, role playing, experiential techniques, games).
- Continually evaluate and work to improve the quality of pain management.

Source: References 50-51.

APS: American Pain Society; OT: occupational therapy; PT: physical therapy; RT: recreation.

## Glossary of Abbreviations and Acronyms

**AAFP:** American Academy of Family Physicians.  
**AAPM:** American Academy of Pain Medicine.  
**AEDs:** Antiepileptic drugs.  
**AHCPR:** Agency for Health Care Policy and Research; now known as the Agency for Healthcare Research and Quality (AHRQ).  
**AHRQ:** Agency for Healthcare Research and Quality; formerly known as the Agency for Health Care Policy and Research (AHCPR).  
**APS:** American Pain Society.  
**ASA:** American Society of Anesthesiologists.  
**ASAM:** American Society of Addiction Medicine.  
**ATC:** Around-the-clock.  
**BPI:** Brief Pain Inventory.  
**CARF:** Commission on Accreditation of Rehabilitation Facilities.  
**CBT:** Cognitive behavioral therapy.  
**CNCP:** Chronic noncancer pain  
**CNMP:** Chronic nonmalignant pain  
**CNS:** Central nervous system  
**COX:** Cyclooxygenase  
**CPGs:** Clinical practice guidelines.  
**CPMP:** Chronic pain management program.  
**CPS:** Chronic pain syndrome  
**DH:** Dorsal horn  
**ECG:** Electrocardiogram.  
**EEAs:** Excitatory amino acids  
**EMLA®:** Eutectic Mixture of Local Anesthetics (lidocaine and prilocaine).  
**FPS:** Faces Pain Scale.  
**FSMB:** The Federation of State Medical Boards of the United States.  
**GABA:**  $\gamma$ -Aminobutyric acid, which is an inhibitory neurotransmitter.  
**GI:** Gastrointestinal.  
**HIV:** Human immunodeficiency virus.  
**IASP:** International Association for the Study of Pain.  
**IM:** Intramuscular.  
**IV:** Intravenous.  
**JCAHO:** Joint Commission on Accreditation of Healthcare Organizations.  
**LAs:** Local anesthetics.  
**LBP:** Low back pain.  
**MPQ:** McGill Pain Questionnaire.  
**NMDA:** N-methyl-D-aspartic acid.  
**NRS:** Numeric rating scale.  
**NSAIDs:** Nonsteroidal anti-inflammatory drugs.

**OA:** Osteoarthritis.  
**OT:** Occupational therapy.  
**PCA:** Patient-controlled anesthesia.  
**PGs:** Prostaglandins.  
**PN:** Peripheral neuropathy.  
**PO:** Per os (oral).  
**PRN:** As needed.  
**PT:** Physical therapy.  
**RA:** Rheumatoid arthritis.  
**SCD:** Sickle cell disease.  
**TCAs:** Tricyclic antidepressants.  
**TENS:** Transcutaneous electrical nerve stimulation.  
**VAS:** Visual analog scale.  
**VHA:** Veterans Health Administration.

## Glossary of definitions

**A- $\delta$  nociceptors:** Nociceptors associated with relatively rapidly conducting A-delta fibers.

**abstinence syndrome:** A syndrome that may occur with abrupt cessation or diminution of chronic drug administration; the nature and time of onset of this syndrome vary with drug actions and half-life.

**activation:** Excitation of a neuron sufficient to generate a nerve impulse (action potential).

**addiction:** A primary, chronic, neurobiological disease, with genetic, psychosocial, and environmental factors influencing its development and manifestations; addiction is characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and craving.

**adjuvant analgesic:** A medication that is not a primary analgesic but that has independent or additive pain-relieving effects.

**agonists:** Agents that exert pharmacologic effects by binding to and activating stereospecific receptors.

**allodynia:** Pain caused by a stimulus that normally does not provoke pain.

**analgesia:** Absence of pain.

**analgesic ceiling:** A dose of an analgesic beyond which no additional analgesia is obtained.

**ankylosing spondylitis:** Ankylosing (fusing together) spondylitis (spinal inflammation) is a type of arthritis that affects the spine.

- antagonists:** Agents that competitively bind with the binding sites of agonists and thereby inhibit the agonist's actions.
- arachnoiditis:** Inflammation and thickening of the arachnoid membrane (one of three membranes covering the central nervous system) around nerve roots.
- atelectasis:** The absence of gas in part or all of lung (i.e., partial or complete lung collapse).
- autonomic responses:** See sympathetic (nervous system) hyperactivity.
- biofeedback:** The process of training a person (or animal) to regulate physiologic responses by providing feedback (typically sounds or light patterns) about those responses. Clinically, patients are typically taught to control finger temperature, perspiration, muscle tension, and other responses.
- breakthrough pain:** Pain that “breaks through” pain relief provided by ongoing analgesics.
- C-nociceptors:** Nociceptors associated with slowly conducting unmyelinated C-fibers.
- central nervous system (CNS):** Consists of the brain and spinal cord.
- central sensitization:** Enhanced excitability and responsiveness of spinal neurons.
- cerebral cortex:** Gray cellular “mantle” of the brain, which includes the sensory cortex, motor cortex, and association cortex.
- chronic noncancer pain (CNCP):** Persistent pain that is not associated with cancer.
- chronic nonmalignant pain (CNMP):** Persistent pain that is not attributable to a life-threatening condition; some prefer to use alternate terms (i.e., chronic non-cancer pain, chronic non-cancer–related pain).
- chronic pain syndrome (CPS):** Psychosocial disorder that occurs in some patients with chronic noncancer pain in which symptoms of the pain consume the attention of and incapacitate the patient.
- continuous dysesthesia:** A continuous type of neuropathic pain that manifests as burning, electrical, or other abnormal sensations.
- cyclooxygenase (COX):** Enzyme involved in prostaglandin synthesis; there are two isoforms: COX-1 and COX-2.
- deep somatic pain:** A type of somatic pain associated with ongoing activation of nociceptors in muscles, tendons, joint capsules, fascia, or bones.
- deep tissues:** Tissues including bone, muscle, tendons, joint capsules, and fascia.
- dermatomes:** Cutaneous sensory pathways that are defined by sensation; each dermatome corresponds to the area of skin that is supplied by the dorsal roots of a particular sensory nerve.
- dorsal horn (DH):** The posterior gray matter of the spinal cord, which contains cell bodies or neurons; the spinal cord consists of 10 laminae (segments), and laminae I–VI comprise the dorsal horn.
- dorsal horn neurons:** Neurons in the dorsal horn of the spinal cord, including interneurons and second order (projection) neurons.
- dysesthesia:** An unpleasant abnormal sensation, which may be spontaneous or evoked.
- endogenous opioids:** Natural opioids produced by the body; also referred to as enkephalins and endorphins.
- epidural:** Situated on the outside of the dura mater (a tough lining that surrounds the spinal cord).
- equianalgesic:** Having an equivalent analgesic effect.
- equianalgesic dose chart:** A chart that is used to convert from one analgesic or route of administration to another. Such charts typically describe the dose of an opioid required to produce the same degree of pain relief provided by a standard oral or parenteral dose of morphine.
- excitatory amino acids (EAAs):** These include the neurotransmitters glutamate and aspartate, which mediate most excitatory transmission in the central nervous system.
- glutamate:** An excitatory amino acid neurotransmitter responsible for much of excitatory transmission in the central nervous system.
- hyperalgesia:** An abnormally painful response to a stimulus.
- hyperpathia:** An abnormally painful and exaggerated response to a stimulus, especially a repetitive stimulus.
- iatrogenic:** A response to a medical or surgical treatment induced by the treatment itself.
- inflammation:** A pathologic process involving complex chemical and cellular reactions that occurs in tissues in response to injury or abnormal stimulation. Its cardinal signs—*rubor* (redness), *calor* (heat or warmth), *tumor* (swelling), and *dolor* (pain)—reflect processes directed at destroying/removing injurious material and at promoting repair and healing.
- inflammatory mediators:** Inflammatory mediators include prostaglandins, bradykinin, serotonin, and histamine.
- ischemia:** A reduction in local blood flow due to obstruction of the blood supply.
- lancinating pain:** A type of neuropathic pain that manifests as an episodic shooting, stabbing, or knifelike pain.
- limbic system:** The limbic system includes structures such as the amygdala, hippocampus, septal nuclei, hypothalamus, and transitional cortical regions (e.g., cingulate gyrus). This part of the brain is involved with emotional responses.
- mu agonists:** Opioids that bind to  $m_1$  and  $m_2$  receptors in the brain, spinal cord, and under certain conditions

(i.e., inflammation), the periphery to exert their effects.

**multimodal analgesia:** Also known as “balanced analgesia,” this approach to pain management involves the use of more than one method or modality of controlling pain (e.g., drugs from two or more classes, drug plus nondrug treatment) to obtain additive beneficial effects, reduce side effects, or both.

**neuroablation:** Destruction of tissue, typically by surgical, chemical (phenol), or heat (radiofrequency) lesions; the goal of neuroablative surgeries is to interrupt signal flow between peripheral sources of pain and the brain or to remove neural structures that contribute to pain.

**neurolysis:** A technique for destroying neural tissue that involves injection of a destructive chemical or use of cold (cryotherapy) or heat (radiofrequency coagulation).

**NMDA receptors:** A type of glutamate receptor involved in mediating excitatory neurotransmission; these receptors are thought to play an important role in central sensitization.

**nociceptors:** Sensory receptors that are preferentially sensitive to tissue trauma or a stimulus that would damage tissue if prolonged.

**parenteral administration:** Administration of a drug via a route other than the gastrointestinal system, such as by intravenous, intramuscular, or subcutaneous injection.

**paresthesia:** An abnormal sensation (e.g., “pins and needles” from a foot “going to sleep”), which may be spontaneous or evoked.

**patient-controlled anesthesia (PCA):** The self-administration of analgesics by a patient; often involves an intravenous, subcutaneous, or epidural opioid administered via a pump.

**perioperative pain:** Pain that is present in a surgical patient because of preexisting disease, the surgical procedure (e.g., associated drains, chest or nasogastric tubes, complications), or a combination of disease-related and procedure-related sources.

**peripheral sensitization:** A lowering of the stimulus (pain) threshold for nociceptor activation and an increase in the frequency of nerve impulse firing.

**physical dependence:** A state of adaptation that often includes tolerance and is manifested by a drug class-specific withdrawal syndrome that can be produced by abrupt cessation, rapid dose reduction, decreasing blood levels of the drug, and/or administration of an antagonist.

**potency:** The dose of a drug required to produce a particular effect (e.g., pain relief).

**preemptive analgesia:** A pharmacologic intervention performed before a noxious event (e.g., surgery) that is intended to minimize the impact of the stimulus by preventing peripheral and central sensitization.

**primary afferent (nerve) fibers:** Axons of primary affer-

ent (or “first order”) neurons that transmit impulses from the periphery toward the central nervous system. Each neuron has a cell body that resides in sensory ganglia (e.g., dorsal root ganglia) and a bifurcated axon. One branch extends along a peripheral nerve and ends in a sensory receptor; the other branch projects to the spinal cord, where it synapses with a spinal neuron (e.g., interneuron, projection neuron).

**projection neurons:** Neurons in the dorsal horn of the spinal cord with nerve fibers that project to the brain in tracts; these neurons are responsible for transmitting nociceptive information from the spinal cord to higher centers.

**pseudoaddiction:** Patient behaviors that may occur when pain is undertreated (e.g., increased focus on obtaining medications or “drug seeking,” “clock watching,” use of illicit drugs, or deception) and that can be mistaken for true addiction.

**responsiveness:** The probability of achieving adequate pain relief with an analgesic without encountering unmanageable side effects.

**somatic pain:** Pain arising from tissues such as skin, muscle, tendon, joint capsules, fasciae, and bone.

**somatosensory cortex:** A subdivision of the sensory cortex.

**spinothalamic tract (STT):** Major pathway by which nociceptive information travels from the dorsal horn of the spinal cord to the thalamus.

**“stress hormone” response:** A series of responses to an acute injury or stress that leads to an increase in the metabolic rate, blood clotting, and water retention; impaired immune function; and a “fight or flight” alarm reaction with autonomic features. These responses minimize further damage and blood loss, promote healing, prevent or fight infection, and reduce blood flow to vital organs, among other functions.

**substance P:** A neuropeptide that activates spinal neurons and enhances their responsiveness to excitatory amino acids, thus facilitating nociception.

**superficial (cutaneous) somatic pain:** A type of somatic pain associated with ongoing activation of nociceptors in the skin, subcutaneous tissue, or mucous membranes.

**sympathetic (nervous system) hyperactivity:**

Symptoms and signs of sympathetic (autonomic) nervous system hyperactivity include increased heart rate, blood pressure, and respiratory rate; sweating; pallor; dilated pupils; nausea; vomiting; dry mouth; and increased muscle tension.

**tolerance:** A state of adaptation in which exposure to a drug induces changes that result in a diminution of one or more of the drug’s effects over time.

**visceral pain:** Pain arising from visceral organs (e.g., heart, lungs, gastrointestinal tract, liver, gallbladder, kidneys, bladder).

## References Section I: Background and Significance

- Gallup survey conducted by the Gallup Organization from May 21 to June 9, 1999. Supported by the Arthritis Foundation and Merck & Company, Inc.
- Fox CD, Berger D, Fine PG, et al. Pain assessment and treatment in the managed care environment. A position statement from the American Pain Society. Glenview, IL: American Pain Society; 2000.
- National Pain Survey. Conducted for Ortho-McNeil Pharmaceutical, 1999.
- American Pain Foundation. Facts about pain. Available at: [http://www.painfoundation.org/page\\_fastfacts.asp](http://www.painfoundation.org/page_fastfacts.asp). Accessed September 2001.
- Brookoff D. Chronic pain: 1. A new disease? Hospital Practice. Available at: [www.hosprract.com/issues/2000/07/brook.htm](http://www.hosprract.com/issues/2000/07/brook.htm). Accessed June 2001.
- Teoh N, Sjtjensward J. WHO cancer pain relief program: ten years on. IASP Newsletter, 1992.
- Brookoff D. Chronic pain: 2. The case for opioids. Hospital Practice. Available at: [www.hosprract.com/issues/2000/09/brook.htm](http://www.hosprract.com/issues/2000/09/brook.htm). Accessed June 2001.
- American Pain Society Quality of Care Committee. Quality improvement guidelines for the treatment of acute pain and cancer pain. JAMA. 1995;273:1874-1880.
- Field MJ, Cassel CK, eds; Committee on Care at the End of Life. Approaching Death: Improving Care at the End of Life. Washington, DC: Institute of Medicine, National Academy Press; 1997.
- Carr DB, Goudas LC. Acute pain. Lancet. 1999;2051-2058.
- American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health and the American Pain Society Task Force on Pain in Infants, Children, and Adolescents. The assessment and management of acute pain in infants, children, and adolescents (0793). Available at: <http://www.aap.org/policy/9933.html>. Accessed September 2001.
- Chronic Pain in America Survey. Conducted for American Pain Society, the American Academy of Pain Medicine, and Janssen Pharmaceutica, 1999.
- Jacox AK, Carr DB, Chapman CR, et al. Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1. Rockville, MD: US Department of Health and Human Services, Agency for Health Care Policy and Research; 1992. AHCPR publication 92-0032.
- American Pain Society. Chronic pain in America: roadblocks to relief. Available at: <http://www.ampainsoc.org/whatsnew/conclude-road.htm>. Accessed June 2001.
- Becker N, Bondegaard Thomsen A, Olsen AK, et al. Pain epidemiology and health related quality of life in chronic non-malignant pain patients referred to a Danish multidisciplinary pain center. Pain. 1997;73:393-400.
- Butler RJ, Hartwig R, Gardner HH. HMOs moral hazard and cost shifting in workers' compensation. J Health Econ. 1997;16:191-206.
- Joint Commission on Accreditation of Healthcare Organizations. Pain management standards. Effective January 1, 2001. Available at: [www.jcabo.org/standard/pain\\_hap.html](http://www.jcabo.org/standard/pain_hap.html). Accessed September 2001.
- McCaffery M. Nursing practice theories related to cognition, bodily pain and man-environmental interactions, Los Angeles, CA: 1968. UCLA Students Store.
- Merskey H, Bugduk N. Classification of Chronic Pain. Descriptions of Chronic Pain Syndromes and Definitions of Pain Terms. 2nd ed. Seattle, WA: IASP Press; 1994.
- Fields HL. Pain. New York: McGraw Hill; 1987:364.
- Besson JM, Chaouch A. Peripheral and spinal mechanism of nociception. Physiol Rev. 1987;67:167-186.
- Chapman CR, Nakamura Y. A passion of the Soul: an introduction to pain for consciousness researchers. Conscious Cogn. 1999;8:391-422.
- Pasero C, Paice JA, McCaffery M. Basic mechanisms underlying the causes and effects of pain. In: McCaffery M, Pasero C, eds. Pain Clinical Manual. 2nd ed. St. Louis, MO: Mosby Inc; 1999:15-34.
- Byers M, Bonica JJ. Peripheral pain mechanisms and nociceptor plasticity. In: Loeser JD, Butler SH, Chapman CR, et al, eds. Bonica's Management of Pain. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:26-72.
- Meyer RA, Campbell JN, Raja SN. Peripheral neural mechanisms of nociception. In: Wall PD, Melzack R, eds. Textbook of Pain. 3rd ed. Edinburgh: Churchill Livingstone; 1994.
- Woolf CJ. Recent advances in the pathophysiology of acute pain. Br J Anesthesiol. 1989;63:139-146.
- Costigan M, Woolf CJ. Pain: molecular mechanisms. J Pain. 2000;1(3 suppl 1):35-44.
- Woolf CJ. The pathophysiology of peripheral neuropathic pain-abnormal peripheral input and abnormal central processing. Acta Neuochir Suppl. 1993;58:125-130.
- Vane JR. Inhibition of prostaglandin synthesis as a mechanism of action for aspirin-like drugs. Nature. 1971;234:231-238.
- Smith JB, Willis AL. Aspirin selectively inhibits prostaglandin production in human platelets. Nat New Biol. 1971;231:235-237.
- Willis WD, Westlund KN. Neuroanatomy of the pain system and of the pathways that modulate pain. J Clin Neurophysiol. 1997;14:2-31.
- Craig AD. Spinal pathways and mechanisms relevant to central pain. In: Case KL, ed. Pain and Central Nervous System Disease: The Central Pain Syndromes. New York: 1991:157-170.
- Wilcox F. Excitatory neurotransmitters and pain. In: Bond MR, Charlton JE, Woolf CJ, eds. Pain Research and Clinical Management. Vol. 4. Proceedings of the Vth World Congress on Pain. Amsterdam: Elsevier; 1991:97-117.
- Ueda H. In vivo molecular signal transduction of peripheral mechanisms of pain [review]. Jpn J Pharmacol. 1999;79(3):263-268.
- Aimar P, Pasti L, Carmignoto G, et al. Nitric oxide-producing islet cells modulate the release of sensory neuropeptides in the rat substantia gelatinosa. J Neurosci. 1998;18(24):10375-10388.
- Yaksh TL, Hua XY, Kalcheva I, et al. The spinal biology in humans and animals of pain states generated by persistent small afferent input [colloquium]. Proc Natl Acad Sci USA. 1999;96(14):7680-7686.
- Randic M, Hecimovic H, Ryu PD. Substance P modulates glutamate-induced currents in acutely isolated rat spinal dorsal horn neurones. Neurosci Lett. 1990;117(1-2):74-80.
- Coderre TJ, Katz J, Vaccarino AL, et al. Contribution of central neuroplasticity to pathological pain: review of clinical and experimental evidence. Pain. 1993;52:259-285.
- Terman GW, Bonica JJ. Spinal mechanisms and their modulation. In: Loeser JD, Butler SH, Chapman CR, Turk DC, eds. Bonica's Management of Pain. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:73-152.
- Jeftiniija S. Enkephalins modulate excitatory synaptic transmission in the superficial dorsal horn by acting at mu-opioid receptors sites. Brain Res. 1988;460(2):260-268.
- Hori Y, Endo K, Takahashi T. Presynaptic inhibitory action of enkephalin on excitatory transmission in superficial dorsal horn of the rat spinal cord. J Physiol (Lond). 1992;450:673-685.
- Schneider SP, Eckert WA III, Light AR. Opioid-activated postsynaptic inward rectifying potassium currents in whole cell recordings in substantia gelatinosa neurons. J Neurophys. 1998;80(6):2954-2962.
- Guilbaud G, Bernard JF, Besson JM. Brain areas involved in nociception and pain. In: Wall PD, Melzack R, eds. Textbook of Pain. 3rd ed. Edinburgh: Churchill Livingstone; 1994.
- Willis WD, Westlund KN. Neuroanatomy of the pain system and of the pathways that modulate pain. J Clin Neurophysiol. 1997;14:2-31.
- Duggan AW, North RA. Electrophysiology of opioids. Pharmacol Rev. 1983;35:219-281.
- Portenoy RK. Basic mechanisms. In: Portenoy RK, Kanner RM, eds. Pain Management: Theory and Practice. Philadelphia: FD Davis; 1996:19-39.
- Chapman CR. The psychophysiology of pain. In: Loeser JD, Butler SH, Chapman CR, Turk DC, eds. Bonica's Management of Pain. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:461-477.
- Covington EC. The biological basis of pain. Int Rev Psychiatry. 2000;12:128-147.
- Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965;150:971-979.
- Basbaum AI, Fields HL. Endogenous pain control systems: brainstem spinal pathways and endorphin circuitry. Annu Rev Neurosci. 1984;7:309-338.
- Hammond DL. Control systems for nociceptive afferent processing: the descending inhibitory pathways. In: Yaksh TL, ed. Spinal Afferent Processing. New York: Plenum Press; 1986:363-390.
- Wallace K. The pathophysiology of pain. Crit Care Nurs Q. 1992;15(2):1-13.
- Walsh TD. Antidepressants in chronic pain. Clin Neuropharmacol. 1983;6(4):271-295.
- Yaksh TL. Direct evidence that spinal serotonin and noradrenergic terminals mediate the spinal antinociceptive effects of morphine in the periaqueductal gray. Brain Res. 1979;160:180-185.
- Schmidt RF, Schaible HG, Messlinger K, et al. Silent and active nociceptors: structure, functions, and clinical implications. In: Gebhart GF, Hammon DL, Jensen TS, eds. Progress in Pain Research and Management. Vol. 2. Seattle: IASP Press; 1994:235-247.
- Neumann S, Doubell TP, Leslie T, et al. Inflammatory pain hypersensitivity mediated by phenotypic switch in myelinated primary sensory neurons. Nature. 1996;384:360-364.
- Perl ER. Cutaneous polymodal receptors: characteristics and plasticity. Prog Brain Res. 1996;113:21-28.
- Levine J, Taiwo Y. Inflammatory pain. In: Wall PD, Melzack R, eds. Textbook of Pain. Edinburgh: Churchill Livingstone; 1994:45-56.
- Alexander J, Black A. Pain mechanisms and the management of neuropathic pain. Curr Opin Neurol Neurosurg. 1992;5:228-234.
- Fields HL, Rowbotham M, Baron R. Postherpetic neuralgia: irritable nociceptors and deafferentation. Neurobiol Dis. 1998;5:209-227.
- Woolf CJ. Evidence for a central component of post-injury pain hypersensitivity. Nature. 1983;306:686-688.

61. Mendell LM. Physiological properties of unmyelinated fiber projections to the spinal cord. *Exp Neurol.* 1966;16:316-332.
62. King AE, Thompson SW. Characterization of deep dorsal horn neurones in the rat spinal cord in vitro: synaptic and excitatory amino acid induced excitations. *Comp Biochem Physiol A.* 1989;93(1):171-175.
63. Price DD, Mao J, Mayer DJ. Central mechanisms of normal and abnormal pain states. In: Fields HL, Liebeskind JC, eds. *Progress in Pain Research and Management.* Vol. 1. Seattle: IASP Press;1994:61-84.
64. MacDermott AB, Mayer ML, Westbrook GL, et al. NMDA-receptor activation increase cytoplasmic calcium concentration in cultured spinal cord neurons. *Nature.* 1986;321:519-522.
65. Yashpal K, Pitcher GM, Parent A, et al. Noxious thermal and chemical stimulation induce in-cresins in 3 H-phorbol 12,13-dibutyrate binding in spinal cord dorsal horn as well as persistent pain and hyperalgesia, which is reduced by inhibition of protein kinase C. *J. Neurosci.* 1995;15:3263-3272.
66. Price DD, McHaffie JG, Larson MA. Spatial summation of heat-induced pain: influence of stimulus area and spatial separation of stimuli on perceived pain sensation and intensity and unpleasantness. *J Neurophysiol.* 1989;62:1270-1279.
67. Woolf, CJ, Thompson SW. The induction and maintenance of central sensitization is dependent on N-methyl-D-aspartic acid receptor activation: implication for the treatment of post-injury pain hypersensitivity states. *Pain.* 1991;44:293-299.
68. Yashpal K, Rakhakrishnan V, Coderre TJ, et al. CP-96,344, but not its stereoisomer, CP-96,344, blocks the nociceptive responses to intrathecally administered substance P and to noxious thermal and chemical stimuli in the rat. *Neuroscience.* 1993;52:1039-1047.
69. Ren K, Iadarola MJ, Dubner R. An isobolographic analysis of the effects of N-methyl-D-aspartate and NK1 tachykinin receptor antagonists on inflammatory hyperalgesia in the rat. *Br J Pharmacol.* 1996;117:196-202.
70. Ma QP, Allchorne AJ, Woolf CJ. Morphine, the NMDA receptor antagonist MK801 and the tachykinin NK1 receptor antagonist RP67580 attenuate the development of inflammation-induced progressive tactile hypersensitivity. *Pain.* 1998;77:49-57.
71. Woolf CJ, King AE. Dynamic alterations in the cutaneous mechanoreceptive fields of dorsal horn neurons in the rat spinal cord. *J Neurosci.* 1990;10:2717-2726.
72. Yaksh TL, Malmberg AB. Central pharmacology of nociceptive transmission. In: Wall PD, Melzack R, eds. *Textbook of Pain.* 3rd ed. Edinburgh: Churchill Livingstone; 1994.
73. Baranauskas G, Nistri A. Sensitization of pain pathways in the spinal cord: cellular mechanisms. *Prog Neurobiol.* 1998;54(3):349-65.
74. Yu XM, Salter MW. Src, a molecular switch governing gain control of synaptic transmission mediated by N-methyl-D-aspartate receptors. *Proc Natl Acad Sci USA.* 1999;96:7697-7704.
75. Woolf CJ, Wall PD. Morphine-sensitive and morphine-insensitive actions of C-fibre input on the rat spinal cord. *Neurosci Lett.* 1986;64:221-225.
76. McMahon SB, Wall PD. Receptive fields of rat lamina I projection cells move to incorporate a nearby region of injury. *Pain.* 1984;19:235-247.
77. Dickenson AH. Central acute pain mechanisms. *Ann Med.* 1995;27:223-227.
78. Cervero F, Laird JM, Pozo MA. Selective changes of receptive field properties of spinal nociceptive neurons induced by noxious visceral stimulation in the cat. *Pain.* 1992;51:335-342.
79. Ru-Rong JI, Woolf CJ. Neuronal plasticity and signal transduction in nociceptive neurons: Implications for the initiation and maintenance of pathological pain. *Neurobiology Dis.* 2001;8:1-10.
80. Hardy JD, Wolff HG, Goodell H. Experimental evidence on the nature of cutaneous hyperalgesia. *J Clin Invest.* 1950;29:115-140.
81. Woolf CJ. *Pain.* Neurobiol Dis. 2000;7:504-510.
82. McQuay H. Opioids in chronic pain. *Br J Anaesth.* 1989;63:213-226.
83. Wall PD. The prevention of postoperative pain. *Pain.* 1988;33:289-290.
84. Arner S, Meyerson BA. Lack of analgesic effect of opioids on neuropathic and idiopathic forms of pain. *Pain.* 1988;33:11-23.
85. Cherny NI, Thaler HT, Friedlander-Klar H, et al. Opioid responsiveness of cancer pain syndromes caused by neuropathic or nociceptive mechanisms: a combined analysis of controlled, single-dose studies. *Neurology.* 1994;44:857-861.
86. Covington EC. Anticonvulsants for neuropathic pain and detoxification. *Cleveland Clin J Med.* 1998;65(suppl 1):S1-21-S1-29.
87. Portenoy R. Mechanisms of clinical pain. Observations and speculations. *Neuro Clin North Am.* 1989;7:205-230.
88. Coda BA, Bonica JJ. General considerations of acute pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:222-240.
89. Gebhart GF, Ness TJ. Central mechanisms of visceral pain. *Can J Physiol Pharmacol.* 1991;69:627-634.
90. Meyer RA, Campbell JN, Raja SN. Peripheral neural mechanisms of cutaneous hyperalgesia. In: Fields HL, Dubner R, Cervero F, eds. *Advances in Pain Research and Therapy.* Vol. 9. New York: Raven; 1985:53-71.
91. Devor M. Neuropathic pain and injured nerve: peripheral mechanisms. *Br Med Bull.* 1991;47, 619-630.
92. Devor M. The pathophysiology of damaged peripheral nerves. In: Wall PD, Melzack R, eds. *Textbook of Pain.* 3rd ed. Edinburgh: Churchill Livingstone; 1994:79-100.
93. Inbal R, Rouso M, Ashur H, et al. Collateral sprouting in skin and sensory recovery after nerve injury in man. *Pain.* 1987;28:141-154.
94. Koltzenburg M. Painful neuropathies. *Curr Opin Neurol.* 1998;11:515-521.
95. Woolf CJ, Mannion RJ. Neuropathic pain: aetiology, symptoms, mechanisms, and management. *Lancet.* 1999;353:1959-1964.
96. Portenoy RK. Neuropathic pain. In Portenoy RK, Kanner RM, eds. *Pain Management: Theory and Practice.* Philadelphia: FD Davis; 1996:83-125.
97. Portenoy RK, Kanner RM. Definition and assessment of pain. In Portenoy RK, Kanner RM, eds. *Pain Management: Theory and Practice.* Philadelphia: FD Davis; 1996:3-18.
- 97a. Portenoy RK. Management of neuropathic pain. In: Chapman CR, Foley K, eds. *Current and Emerging Issues in Cancer Pain: Research and Practice.* Lippincott-Raven; 1993: chapter 21. Available at: [http://talaria.org/ch21.html#ch21.html\\_1](http://talaria.org/ch21.html#ch21.html_1). Accessed September 2001.
- 97b. Backonja MM. Painful Neuropathies. In: Loeser JD, Butler SH, Chapman CR, Turk DC, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:371-387.
- 97c. Galer BS, Schwartz L, Allen RJ. Complex regional pain syndromes—type I: reflex sympathetic dystrophy, and type II: causalgia. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:388-411.
- 97d. Tasker RR. Central pain states. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:433-457.
98. Turk DC, Okifuji A. Pain Terms and taxonomies of pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:17-25.
99. Jacobsen L, Mariano A. General considerations of chronic pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain.* 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:241-254.
100. Dunajcik L. Chronic nonmalignant pain. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual,* 2nd ed. St. Louis, MO: Mosby Inc; 1999:467-521.
101. Chapman CR, Stillman M. Pathological pain. In: Kruger L, ed. *Pain and Touch.* 2nd ed. New York: Academic Press; 1996:315-342.
102. Chapman CR, Foley K, eds. *Current and Emerging Issues in Cancer Pain: Research and Practice.* Lippincott-Raven; 1993. Available at: <http://talaria.org/chtoc.html>. Accessed September 2001.
103. Schappert SM. Ambulatory care visits to physician offices, hospital outpatient departments, and emergency departments: United States, 1996. *NCHS Vital Health Stat.* 1998;13:1-37.
104. American Academy of Pain Medicine. FAQs about pain. Available at: <http://www.painmed.org>. Accessed April 2001.
105. Hitchcock LS, Ferrell BR, McCaffery M. The experience of chronic non-malignant pain. *J Pain Symptom Manage.* 1994;9:312-318.
106. Marks RM, Sachar EJ. Undertreatment of medical inpatients with narcotic analgesics. *Ann Intern Med.* 1973;78:173-181.
107. Donovan M, Dillon P, McGuire L. Incidence and characteristics of pain in a sample of medical-surgical inpatients. *Pain.* 1987;30:69-78.
108. Oden R. Acute postoperative pain: Incidence, severity, and the etiology of inadequate treatment. *Anesthesiol. Clin North Am.* 1989;7:1-15.
109. Carr DB, Miasowski C, Dedrick SC, Williams GR. Management of perioperative pain in hospitalized patients: a national survey. *J Clin Anesth.* 1998;10(1):77-85.
110. Abbott FV, Gray-Donald K, Sewitch MJ, Johnston CC, Edgar L, Jeans ME. The prevalence of pain in hospitalized patients and resolution over six months. *Pain.* 1992;50(1):15-28.
111. Gu X, Belgrade MJ. Pain in hospitalized patients with medical illnesses. *J Pain Symptom Manage.* 1993;8(1):17-21.
112. Ward SE, Gordon D. Application of the American Pain Society quality assurance standards. *Pain.* 1994;56:299-306.
113. Warfield CA, Kahn CH. Acute pain management: programs in U.S. hospitals and experiences and attitudes among U.S. adults. *Anesthesiology.* 1995;83:1090-1094.
114. Drayer RA, Henderson J, Reidenberg M. Barriers to better pain control in hospitalized patients. *J Pain Symptom Manage.* 1999;17(6):434-440.
115. Todd KH, Samaroo N, Hoffman JR. Ethnicity as a risk factor for inadequate emergency department analgesia. *JAMA.* 1993;269(12):1537-1539.
116. Cleeland CS, Gonin R, Hatfield AK, et al. Pain and its treatment in outpatients with metastatic cancer. *N Engl J Med.* 1994;330(9):592-596.
117. Zhukovsky DS, Gorowski E, Hausdorff J, et al. Unmet analgesic needs in cancer patients. *J Pain Symptom Manage.* 1995;10(2):113-119.
118. Cleeland CS, Gonin R, Baez L, et al. Pain and treatment of pain in minority patients with cancer. The Eastern Cooperative Oncology Group Minority Outpatient Pain Study. *Ann Intern Med.* 1997;127(9):813-816.
119. Anderson KO, Mendoza TR, Valero V, et al. Minority cancer patients and their providers: pain management attitudes and practice. *Cancer.* 2000;88(8):1929-1938.
120. Wolfe J, Grier HE, Klar N, et al. Symptoms and suffering at the end of life in children with cancer. *N Engl J Med.* 2000;342(5):326-33.

121. Weiss SC, Emanuel LL, Fairclough DL, Emanuel EJ. Understanding the experience of pain in terminally ill patients. *Lancet*. 2001;357(9265):1311-1315.
122. Foley KM. Controlling cancer pain. *Hospital Practice*. Available at: <http://www.hosppractice.com/issues/20000/04/foley.htm>. 2000. Accessed June 2001.
123. Anand KJ, Hickey PR. Halothane-morphine compared with high-dose sufentanil for anesthesia and postoperative analgesia in neonatal cardiac surgery. *N Engl J Med*. 1992;326(1):1-9.
124. Bach S, Noreng MF, Tjellden NU. Phantom limb pain in amputees during the first 12 months following limb amputation, after postoperative lumbar epidural blockade. *Pain*. 1988;33:297-301.
125. Tasmuth T, Estlanderb A, Kalso E. Effect of present pain and mood on the memory of past postoperative pain in women treated surgically for breast cancer. *Pain*. 1996;68:343-347.
126. Foley KM. Pain syndromes in patients with cancer. In: Portenoy RK, Kanner RM, eds. *Pain Management: Theory and Practice*. Philadelphia: FA Davis; 1996:191-215.
127. Cherny NI, Portenoy RK. Practical issues in the management of cancer pain. In: Wall, PD, Melzack R, eds. *Textbook of Pain*. 3rd ed. Edinburgh: Churchill Livingstone; 1994:1437-1467.
128. Elliot KJ (presenter). Herpes zoster and postherpetic neuralgia: new pharmacological approaches to treatment and prevention. American Pain Society 15th Annual Scientific Meeting; Washington, DC; November 14-17, 1996.
129. Desbiens NA, Wu AW, Alzola C, et al. Pain during hospitalization is associated with continued pain six months later in survivors of serious illnesses. *Am J Med*. 1997;103:269-276.
130. Walker LS, Garber J, Van Slyke DA, Greene JW. Long-term health outcomes in patients with recurrent abdominal pain. *J Pediatr Psychol*. 1995;20:233-245.
131. Bursch B. Pain in infants, children, and adolescents SIG. Policy statement on pediatric chronic pain. *APS Bulletin*. 2000;10(3). Available at: <http://www.ampainsoc.org/pub/bulletin/may00/sig1.htm>. Accessed September 2001.
132. Ferrell BR, Grant M, Chan J, et al. The impact of cancer education on family caregivers of elderly patients. *Oncol Nurs Forum*. 1995;22(8):1211-1218.
133. The NIH Guide: New Directions in Pain Research I. Washington, DC: U.S. Government Printing Office; 1998.
134. Gordon DB, Dahl JL, Stevenson KK. Introduction. In: Gordon DB, Dahl JL, Stevenson KK, eds. *Building an Institutional Commitment to Pain Management. The Wisconsin Resource Manual*. 2nd ed. Madison: University of Wisconsin-Madison Board of Regents; 2000.
135. Burke JP, Pestotnik SL, Classen DC, Lloyd JF. Evaluation of the financial impact of ketorolac tromethamine therapy in hospitalized patients. *Clin Ther*. 1996;18(1):197-211.
136. Pain and absenteeism in the workplace. Study conducted for Ortho-McNeil Pharmaceutical, 1997.
137. Association of Ottawa Anesthesiologists. Patient populations and pain syndromes to be treated. *Chronic Pain Management Unit (CPMU)*. Available at: <http://www.anesthesia.org/pmu/pmu8.html>. Accessed September 2001.
138. Jacox A, Carr DB, Payne R, et al. Management Of Cancer Pain: Adults Quick Reference Guide No. 9. Rockville, MD: U.S. Department of Human and Health Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0593.
139. Booss J, Drake A, Kerns RD, Ryan B, Wasse L, . Pain as the 5th Vital Sign Toolkit. Geriatrics and Extended Care Strategic Healthcare Group, National Pain Management Coordinating Committee, Veterans Health Administration. Revised edition. October, 2000.
140. McCaffery M, Pasero C. Assessment: underlying complexities, misconceptions, and practical tools. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:35-102.
141. Berry PH, Dahl JL. Barriers to adequate pain management: an Ishikawa (Fishbone) diagram. Institutionalizing Pain Management Project. University of Wisconsin-Madison. 1998.
142. McCaffery M. Pain management: problems and progress. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:1-14.
143. President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry. *Quality First: Better Health Care for All Americans*. Washington D.C.: U.S. Government Printing Office; 1998.
144. Jacox A, Carr DB, Payne R, et al. *Clinical Practice Guideline: Management of Cancer Pain*. Rockville, MD: US Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0592.
145. Grossman SA, Scheidler VR, Sweeden K, et al. Correlation of patient and caregiver ratings of cancer pain. *J Pain Symptom Manage*. 1991;6:53-57.
146. Paice JA, Mahon SM, Faut-Callahan M. Factors associated with adequate pain control in hospitalized postsurgical patients diagnosed with cancer. *Cancer Nurs*. 1991;14:298-305.
147. Von Roenn JH, Cleeland CS, Gonin R, et al. Physician attitudes and practice in cancer pain management: a survey from the Eastern Cooperative Oncology Group. *Ann Intern Med*. 1993;119:121-126.
148. Heavner JE, Shi B, Diede J, et al. Acetaminophen (paracetamol) use and blood concentrations in pain patients. *Pain Digest*. 1996;6:215-218.
149. Burney KD, Krishnan K, Ruff MT, et al. Adherence to single daily dose of aspirin in a chemoprevention trial: An evaluation of self-report and microelectronic monitoring. *Arch Fam Med*. 1996;5:297-300.
150. Chapman CR. Compliance with pain medication: A hidden problem? *APS Bulletin*. 1996;6(6):11.
151. Pain & Policy Studies Group. Resource guide. Information about regulatory issues in pain management. Available at: <http://www.medsch.wisc.edu/painpolicy/>. Accessed February 2001.
152. American Society of Addiction Medicine. Definitions related to the use of opioids for the treatment of pain. Consensus document from the American Academy of Pain Medicine, the American Pain Society, and the American Society of Addiction Medicine. February 2001. Available at: <http://www.asam.org>. Accessed June 2001.
153. Weissman DE, Burchman SL, Dinndorf PA, et al. *Handbook of Cancer Pain Management*. 2nd ed. Milwaukee, WI: Wisconsin Cancer Pain Initiative; 1990.
154. Joranson DE, Ryan KM, Gilson AM, et al. Trends in medical use and abuse of opioid analgesics. *JAMA*. 2000;283(13):1710-1714.
155. Newman RG. The need to redefine addiction. *N Engl J Med*. 1983;306:1096-1098.
156. Chapman CR, Hill HF. Prolonged morphine self-administration and addiction liability: evaluation of two theories in a bone marrow transplantation unit. *Cancer*. 1989;63:1636-1644.
157. Portenoy RK, Payne R. Acute and chronic pain. In: Lowinson JH, Ruiz P, Millman R, et al, eds. *Comprehensive Textbook of Substance Abuse*. Baltimore, MD: Williams & Wilkins; 1997.
158. Max MB, Payne R, Edwards WT, Sunshine A, Inturrisi CE, et al. *Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain*. 4th ed. Glenview, IL: American Pain Society; 1999.
159. Haddox JD, Joranson D, Angarola RT, et al., The use of opioids for the treatment of chronic pain: a consensus statement from the American Academy of Pain Medicine and the American Pain Society. Glenview, IL: American Pain Society; 1997. Available at: <http://www.ampainsoc.org/advocacy/opioids.htm>. Accessed September 2001.
160. Federation of State Medical Boards of the United States, Inc. Model guidelines for the use of controlled substances for the treatment of pain. Euless, TX: author (tel: 817-868-4000). May 1998. Available at: <http://www.fsmb.org/policy.htm>. Accessed September 2001.
161. Federation of State Medical Boards of the United States, Inc. White paper in support of adoption of pain management guidelines. February 23, 2000. Available at: <http://www.fsmb.org/policy.htm>. Accessed September 2001.
162. Porter J, Jick H. Addiction rare in patients treated with narcotics [letter]. *N Engl J Med*. 1980;302:123.
163. Perry S, Heidrich G. Management of pain during debridement: a survey of US burn units. *Pain*. 1982;13:12-14.
164. Zenz M, Strumpf M, Tryba M. Long-term oral opioid therapy in patients with chronic nonmalignant pain. *J Pain Symptom Manage*. 1992;7(2):69-77.
165. McCaffery M, Ferrell BR. Nurses' knowledge of pain assessment and management: how much progress have we made? *J Pain Symptom Manage*. 1997;14:175-188.
166. O'Brien S, Dalton JA, Konsler G, et al. The knowledge and attitudes of experienced oncology nurses regarding the management of cancer-related pain. *Oncol Nurs Forum*. 1996;23:515-521.
167. Vothers R, Ryan P, Ward S. Knowledge of, attitudes toward, and barriers to pharmacologic management of cancer pain in a statewide random sample of nurses. *Res Nurs Health*. 1992;15:459-466.

## References Section II: Assessment of Pain

1. Max MB, Payne R, Edwards WT, et al. *Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain*. 4th ed. Glenview, IL: American Pain Society; 1999.
2. Campbell J. Pain as the 5th vital sign [presidential address]. American Pain Society, November 11, 1996.
3. Booss J, Drake A, Kerns RD, et al. Pain as the 5th Vital Sign Toolkit. Geriatrics and Extended Care Strategic Healthcare Group, National Pain Management Coordinating Committee, Veterans Health Administration. Revised edition. October 2000.
4. Joint Commission on Accreditation of Healthcare Organizations. *Pain management standards*. Effective January 1, 2001. Available at: [www.jcaho.org/standard/pain\\_hap.html](http://www.jcaho.org/standard/pain_hap.html). Accessed September 2001.
5. Jacox AK, Carr DB, Chapman CR, et al. *Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1*. Rockville, MD: US Department of Health and Human Services, Agency for Health Care Policy and Research; 1992. AHCPR publication 92-0032.

6. Beecher HK. Limiting factors in experimental pain. *J Chron Dis*. 1956;4:11-12.
7. McCaffery M, Pasero C. Assessment: underlying complexities, misconceptions, and practical tools. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:35-102.
8. Loeser JD. Medical evaluation of the patient with pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:267-279.
9. Wilson PR, Caplan RA, Connis RT, et al, for the American Society of Anesthesiologists, Task Force on Pain Management, Chronic Pain Section. Practice guidelines for chronic pain management. *Anesthesiology*. 1997;86(4):995-1004.
10. Lewis T. *Pain*. New York: Macmillan; 1942:176.
11. Institute for Clinical Systems Improvement (ICSI) Work Group. ICSI Health Care Guideline. Assessment and Management of Acute Pain. September 2000.
12. Chapman CR, Syrjala KL. Measurement of pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:310-328.
13. Herr KA, Mobily PR, Kohout FJ, et al. Evaluation of the Faces Pain Scale for use with the elderly. *Clin J Pain*. 1998;14:29-38.
14. Szyfelbein SK, Osgood PF, Carr D. The assessment of pain and plasma beta-endorphin immunoactivity in burned children. *Pain*. 1985;2:173-182.
15. Beyer JE. Development of a new instrument for measuring intensity of children's pain. *Pain*. 1984;2(suppl):421.
16. Bieri D, Reeve R, Champion G, et al. The Faces Pain Scale for the self-assessment of severity of pain experienced by children: development, initial validation, and preliminary investigation for ratio scale properties. *Pain*. 1990;41:139-150.
17. Ready BL, Ashburn M, Caplan R, et al, for the American Society of Anesthesiologists, Task Force on Pain Management, Acute Pain Section. Practice guidelines for acute pain management in the perioperative setting. *Anesthesiology*. 1995;82(4):1071-8.
18. Dunajcik L. Chronic nonmalignant pain. In: McCaffery M, Pasero C. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:467-521.
19. Stolow WC. Electrodiagnostic evaluation of acute and chronic pain syndromes. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:279-296.
20. Baxter AF, Maravilla KR. Imaging pain patients. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:297-309.
- 20a. Buckley PF. Regional anesthesia with local anesthetics. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1893-1952.
21. Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. *Pain*. 1986;27:117-126.
22. Jensen MP, Turner LR, Turner JA, et al. The use of multi-item scales for pain intensity measurement in chronic pain patients. *Pain*. 1996;67:35-40.
23. Berthier F, Potel G, Leconte P, et al. Comparative study of methods of measuring acute pain intensity in an ED. *Am J Emerg Med*. 1998;16:132-136.
24. Paice JA, Cohen FL. Validity of a verbally administered pain rating scale to measure cancer pain intensity. *Cancer Nurs*. 1997;20:88-93.
25. Kremer E, Atkinson JH, Ignelzi RJ. Measurement of pain: patient preference does not confound pain assessment. *Pain*. 1981;10:241-248.
26. Revill SI, Robinson JO, Rosen M, et al. The reliability of a linear analog for evaluating pain. *Anaesthesia*. 1976;31:1191-1198.
27. Galer BS, Jensen MP. Development and preliminary validation of a pain measure specific to neuropathic pain; the neuropathic pain scale. *Neurology*. 1997;48:322-338.
28. Miller MD, Ferris DG. Measurement of subjective phenomena in primary care research: the Visual Analogue Scale. *Fam Pract Res J*. 1993;13:15-24.
29. Melzack R, Toregerson WS. On the language of pain. *Anesthesiology*. 1971;34:50-59.
30. Wong D, Baker C. Pain in children: comparison of assessment scales. *Pediatr Nurs*. 1988;14:9-17.
31. Wong D, Baker C. Reference Manual for the Wong-Baker FACES Pain Rating Scale. Tulsa, OK: 1995. Wong and Baker.
32. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain*. 1975;1:277-299.
33. Daut RL, Cleeland CS. The prevalence and severity of pain in cancer. *Cancer*. 1982;50:1913-1918.
34. Daut RL, Cleeland CS, Flanery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. *Pain*. 1983;17:197-210.
35. Cleeland CS, Ryan KM. Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore*. 1994;23:129-138.
36. Cleeland CS. Measurement and prevalence of pain in cancer. *Seminars Oncol Nurs*. 1985;1:87-92.
37. Breitbart W, Rosenfield B, Passik S, et al. A comparison of pain report and adequacy of analgesic therapy in ambulatory AIDS patients with and without a history of substance abuse. *Pain*. 1997;72:235-243.
38. Fishman B, Pasternak S, Wallenstein SL, et al. The Memorial Pain Assessment Card: a valid instrument for the evaluation of cancer pain. *Cancer*. 1987;60:1151-1158.
39. Melzack R. The short-form McGill Pain Questionnaire. *Pain*. 1987;30:191-197.
40. American Geriatrics Society. The management of chronic pain in older persons: AGS panel on chronic pain in older persons. *J Am Geriatr Soc*. 1998;46(5):635-651; and *Geriatrics*. 1998;53(suppl 3):S8-24.
41. American Medical Directors Association. *Chronic Pain Management in the Long-Term Care Setting*. Columbia, MD: American Medical Directors Association; 1999.

### References Section III: Types of Treatments

1. Gallup survey conducted by the Gallup Organization from May 21 to June 9, 1999. Supported by the Arthritis Foundation and Merck & Company, Inc.
2. Whelton A. Renal and related cardiovascular effects of conventional and COX-2-specific NSAIDs and non-NSAID analgesics. *Am J Ther*. 2000;7(2):63-74.
3. McCormack K, Brune K. Dissociation between the antinociceptive and anti-inflammatory effects of the nonsteroidal anti-inflammatory drugs: a survey of their analgesic efficacy. *Drugs*. 1991;41:533-547.
4. Vane JR. Inhibition of prostaglandin synthesis as a mechanism of action for aspirin-like drugs. *Nature*. 1971;234:231-238.
5. Smith JB, Willis AL. Aspirin selectively inhibits prostaglandin production in human platelets. *Nat New Biol*. 1971;231:235-237.
6. Coyle N, Cherny NI, Portenoy RK. Pharmacologic management of cancer pain. In: McGuire DB, Yarbro CH, Ferrel BR, eds. *Cancer Pain Management*. 2nd ed. Boston: Jones & Bartlett Publishers; 1995:89-130.
7. Piletta P, Porchet HC, Dayer P. Central analgesic effect of acetaminophen but not of aspirin. *Clin Pharmacol Ther*. 1991;49:350-354.
8. Miyoshi HR. Systemic nonopioid analgesics. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1667-1681.
9. Kwok K, Simms RW, Anderson LG, for the American College of Rheumatology Ad Hoc Committee on Clinical Guidelines. Guidelines for the management of rheumatoid arthritis. *Arthritis Rheum*. 1996;39(5):713-722.
10. O'Neill GP, Ford-Hutchinson AW. Expression of mRNA for cyclooxygenase-1 and cyclooxygenase-2 in human tissues. *FEBS Lett*. 1993;330(2):156-160.
11. Griswold DE, Adams JL. Constitutive cyclooxygenase (COX-1) and inducible cyclooxygenase (COX-2): rationale for selective inhibition and progress to date. *Med Res Rev*. 1996;12:181-206.
12. Pairet M, Engelhardt D. Distinct isoforms (COX-1 and COX-2) of cyclooxygenase: possible physiological and therapeutic implications. *Fundam Clin Pharmacol*. 1996;10:1-15.
13. Harris RC, McKanna JA, Jacobson HR, et al. Cyclooxygenase-2 is associated with the macula densa of rat kidney and increases with salt restriction. *J Clin Invest*. 1994;94(6):2504-2510.
14. Komhoff M, Grone HJ, Klein T, et al. Localization of cyclooxygenase-1 and -2 in adult and fetal human kidney: implication for renal function. *Am J Physiol*. 1997;272(4 pt 2):F460-468.
15. Van Hecken A, Schwartz JI, Depre M, et al. Comparative inhibitory activity of rofecoxib, meloxicam, diclofenac, ibuprofen, and naproxen on COX-2 versus COX-1 in healthy volunteers. *J Clin Pharmacol*. 2000;40(10):1109-1120.
16. Wight NJ, Gottesdiener K, Garlick NM, et al. Rofecoxib, a COX-2 inhibitor, does not inhibit human gastric mucosal prostaglandin production. *Gastroenterology*. 2001;120(4):867-873.
17. Vane JR, Botting RM. The history of anti-inflammatory drugs and their mechanism of action. In: Bazan, N, Botting J, Vane J, eds. *New Targets in Inflammation: Inhibition of COX-2 or Adhesion Molecules*. London: Kluwer Academic Publishers and William Harvey Press; 1996.
18. Matheson AJ, Figgitt DP. Rofecoxib: a review of its use in the management of osteoarthritis, acute pain and rheumatoid arthritis. *Drugs*. 2001;61(6):833-865.
- 18a. U.S. Food and Drug Administration Center for Drug Evaluation and Research. Questions and answers: FDA regulatory actions for the COX-2 selective and non-selective non-steroidal anti-inflammatory drugs (NSAIDs). April 7, 2005. Available at: <http://www.fda.gov/cder/drug/infopage/COX2/COX2qa.htm>.
- 18b. Chandrasekharan NV, Dai H, Roos KL, et al. COX-3, a cyclooxygenase-1 variant inhibited by acetaminophen and other analgesic/antipyretic drugs: cloning, structure, and expression. *Proc Natl Acad Sci USA*. 2002;99:13926-13931.
19. Max MB, Payne R, Edwards WT, et al. *Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain*. 4th ed. Glenview, IL: American Pain Society; 1999.

20. McCaffery M, Portenoy RK. Overview of three groups of analgesics. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:103-128.
21. McCaffery M, Portenoy RK. Nonopioids: acetaminophen and nonsteroidal antiinflammatory drugs (NSAIDs). In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:129-160.
22. Physicians' Desk Reference for Nonprescription Drugs and Dietary Supplements. 22nd ed. Montvale, NJ: Medical Economics Company, Inc; 2001.
23. McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999.
24. Jacox AK, Carr DB, Chapman CR, et al. *Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1992. AHCPR publication 92-0032.
25. Whitcomb DC, Block GD. Association of acetaminophen hepatotoxicity with fasting and ethanol use. *JAMA*. 1994;272:1845-1850.
26. Zimmerman HJ, Maddrey WC. Acetaminophen (paracetamol) hepatotoxicity with regular intake of alcohol: analysis of instances of therapeutic misadventure. *Hepatology*. 1995;22:767-773.
27. Trilisate® Tablets/Liquid (choline magnesium trisilicylate) [package insert]. Stamford, CT: The Purdue Frederick Company; June 9, 2000.
28. Dolobid® Tablets (diflunisal) [package insert]. West Point, PA: Merck & Co., Inc; July 1998.
29. Motrin® Ibuprofen Tablets, USP [package insert]. Kalamazoo, MI: Pharmacia & Upjohn Company; revised April 2000.
30. EC-Naprosyn® (naproxen) Delayed-Release Tablets, Naprosyn® (naproxen) tablets, Anaprox/Anaprox DS® (naproxen sodium), Naprosyn® (naproxen) suspension [package insert]. Nutley, NJ: Roche Laboratories Inc; revised September 1999.
31. Orudis® (ketoprofen) Capsules, Oruvail® (ketoprofen) Extended-Release Capsules [package insert]. Philadelphia, PA: Wyeth-Ayerst Laboratories; revised November 26, 1997.
32. Ansaid® (flurbiprofen) Tablets, USP [package insert]. Kalamazoo, MI: Pharmacia & Upjohn Company; revised April 2000.
33. Daypro® (oxaprozin) Caplets [package insert]. Chicago, IL: G. D. Searle & Co; April 29, 1998.
34. Indocin® Capsules, Oral Suspension, and Suppositories (indomethacin) [package insert]. West Point, PA: Merck & Co, Inc; October 1999.
35. Feldene® (piroxicam) Capsules [package insert]. New York, NY: Pfizer Inc; revised June 1999.
36. Mobic® (meloxicam) Tablets [package insert]. Ridgefield, CT: Boehringer Ingelheim Pharmaceuticals, Inc; and North Chicago, IL: Abbott Laboratories.
37. Arthrotec® (diclofenac potassium and misoprostol) Tablets [package insert]. Chicago, IL: G. D. Searle & Co; revised March 6, 2000.
38. Cataflam® (diclofenac potassium) Immediate-Release Tablets, Voltaren® (diclofenac potassium) Delayed-Release (enteric-coated) Tablets, Voltaren®-XR (diclofenac potassium) Extended-Release Tablets [package insert]. Hanover, NJ: Novartis Pharmaceuticals Corporation; revised May 2000.
39. Toradol®<sup>IV/IM</sup> (ketorolac tromethamine injection) Toradol®<sup>ORAL</sup> (ketorolac tromethamine tablets) [package insert]. Nutley, NJ: Roche Laboratories, Inc; revised March 1999.
40. McEvoy GK, ed. Salicylate salts. In: *AHFS Drug Information 2005*. Bethesda, MD: American Society of Health-System Pharmacists; 2005:1966-1968.
41. Celebrex™ (celecoxib) Capsules [package insert]. Chicago, IL: G. D. Searle & Co; and New York, NY: Pfizer, Inc; revised December 1999.
42. Motrin® IB Pain Reliever/Fever Reducer Tablets, Caplets, and Gelcaps (ibuprofen). Fort Washington, PA: McNeil Consumer Healthcare.
43. Motrin® Migraine Pain Caplets (ibuprofen). Fort Washington, PA: McNeil Consumer Healthcare.
44. Regular Strength Tylenol® acetaminophen Tablets; Extra Strength Tylenol® acetaminophen Gelcaps, Geltabs, Caplets, Tablets; Extra Strength Tylenol® acetaminophen Adult Liquid Pain Reliever; Tylenol® acetaminophen Arthritis Pain Extended Release Caplets. Fort Washington, PA: McNeil Consumer Healthcare.
45. Genuine Bayer® Aspirin Tablets, Caplets, and Gelcaps. Morristown, NJ: Bayer Corporation Consumer Care Division.
46. Aspirin Free Excedrin® Caplets and Geltabs (acetaminophen, caffeine). New York, NY: Bristol-Myers Squibb Company.
47. Excedrin® Extra-Strength Analgesic Tablets, Caplets, and Geltabs (acetaminophen, aspirin, caffeine). New York, NY: Bristol-Myers Squibb Company.
48. Excedrin® Migraine Pain Reliever/Pain Reliever Aid Tablets, Caplets, and Geltabs (acetaminophen, aspirin, caffeine). New York, NY: Bristol-Myers Squibb Company.
49. Orudis® KT™ Pain Reliever/Fever Reducer Tablets (ketoprofen) Madison, NJ: Whitehall-Robins Healthcare.
50. Physicians' Desk Reference. 55th ed. Montvale, NJ: Medical Economics Company, Inc; 2001.
51. Lipman AG. Internal analgesic and antipyretic products. In: *Handbook of Nonprescription Drugs*. Washington DC: American Pharmaceutical Association; 1996:45-74.
52. Manek NJ, Lane NE. Osteoarthritis: current concepts in diagnosis and management. *American Academy of Family Physicians*. March 15, 2000;61(6):1795-1804. Review.
53. Hawkey CJ. Non-steroidal anti-inflammatory drugs and peptic ulcers. *Br Med J*. 1990;300:278-284.
54. Graham DY, Agrawal N, Roth SH. Prevention of NSAID-induced gastric ulcer with misoprostol: multicentre, double-blind, placebo-controlled trial. *Lancet*. 1988;2:1277-1280.
55. Ehsanullah RSB, Page MC, Tildesley G, et al. Prevention of gastroduodenal damage induced by non-steroidal anti-inflammatory drugs: controlled trial of ranitidine. *Br Med J*. 1988;297:1017-1021.
56. Gay G. Another side effect of NSAIDs [editorial]. *JAMA*. 1990;264:2677-2678.
57. Emery P, Zeidler H, Kvien TK, et al. Celecoxib versus diclofenac in long-term management of rheumatoid arthritis: randomised double-blind comparison. *Lancet*. 1999;354(9196):2106-2111.
58. Simon LS, Weaver AL, Graham DY, et al. Anti-inflammatory and upper gastrointestinal effects of celecoxib in rheumatoid arthritis: a randomized controlled trial. *JAMA*. 1999;282:1921-1928.
59. McKenna F, Borenstein D, Wendt H, et al. Celecoxib versus diclofenac in the management of osteoarthritis of the knee. *Scand J Rheumatol*. 2001;30(1):11-18.
60. Simon LS, Lanza FL, Lipsky PE, et al. Preliminary study of the safety and efficacy of SC-58635, a novel cyclooxygenase 2 inhibitor: efficacy and safety in two placebo-controlled trials in osteoarthritis and rheumatoid arthritis, and studies of gastrointestinal and platelet effects. *Arthritis Rheum*. 1998;41:1591-602.
61. Scott LJ, Lamb HM. Rofecoxib. *Drugs*. 1999;58:499-505.
62. Ehrlich EW, Schnitzer TJ, McIlwain H, et al. Effect of specific COX-2 inhibition in osteoarthritis of the knee: a 6 week double blind, placebo controlled pilot study of rofecoxib. *J Rheumatol*. 1999;26:2438-2447.
63. Langman MJ, et al. Adverse upper gastrointestinal effects of rofecoxib compared with NSAIDs. *JAMA*. 1999;282:1929-1933.
64. Greenberg HE, Gottesdiener K, Huntington M, et al. A new cyclooxygenase-2 inhibitor, rofecoxib (VIOXX), did not alter the antiplatelet effects of low-dose aspirin in healthy volunteers. *J Clin Pharmacol*. 2000;40(12 pt 2):1509-1515.
65. Duggan AW, North RA. Electrophysiology of opioids. *Pharmacol Rev*. 1983;35:219-281.
66. Benedetti C. Neuroanatomy and biochemistry of antinociception. In: Bonica JJ, Ventafridda V, eds. *Advances in Pain Research and Therapy*. Vol. 2. New York: Raven Press; 1979:31-44.
67. Stein C. The control of pain in peripheral tissues by opioids. *New Engl J Med*. 1995;332:1685-1690.
68. Reisine T, Pasternak G. Opioid analgesics and antagonists. In: Hardman JG, Limbard LE, eds. *Goodman & Gillman's the Pharmacologic Basis of Therapeutics*. 9th ed. New York: McGraw-Hill, 1996:531-555.
69. Pasero C, Portenoy RK, McCaffery M. Opioid analgesics. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:161-299.
70. Attal N. Chronic neuropathic pain: mechanisms and treatment. *Clin J Pain*. 2000;16:S118-130.
71. Brookoff D. Chronic pain: 2. The case for opioids. *Hospital Practice*. Available at: <http://www.hosppractice.com/issues/2000/09/brook.htm>. Accessed June 2001.
72. Carr DB, Jacox AK, Chapman CR, et al., *Acute Pain Management in Adults: Operative Procedures Quick Reference Guide for Clinicians No. 1a*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; February 1993. AHCPR publication 92-0019.
73. Jacox A, Carr DB, Payne R, et al. *Clinical Practice Guideline: Management of Cancer Pain*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0592.
74. Benjamin LJ, Dampier CD, Jacox A, et al. *Guideline for the Management of Acute and Chronic Pain in Sickle Cell Disease*. Glenview, IL: American Pain Society; August 1999. APS Clinical Practice Guidelines Series No. 1.
75. Miyoshi HR, Leckband SG. Systemic opioid analgesics. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1682-1709.
76. Roxanol™, Roxanol™-T, Roxanol 100™ morphine sulfate (immediate release) Oral Solution (concentrate) [package insert]. Columbus, OH: Roxanne Laboratories, Inc; revised February 1999.
77. MSIR® Oral Solution, Oral Solution Concentrate, Immediate-Release Oral Tablets, Immediate-Release Oral Capsules (morphine sulfate) [package insert]. Stamford, CT: The Purdue Frederick Company; June 9, 2000 (2001 PDR pages 2680-2683).
78. MS Contin® Tablets (morphine sulfate controlled release) [package insert]. Stamford, CT: The Purdue Frederick Company; June 9, 2000.
79. Dilaudid® Ampules & Multiple Dose Vials (parenteral), Color Coded Tablets (2, 4 mg), Rectal Suppositories, Non-Sterile Powder (hydromorphone hydrochloride) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; and North Chicago, IL: Abbott Laboratories; revised December 1999.

## References

80. Dilaudid-HP® Injection (hydromorphone hydrochloride) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised October 1999.
81. Dilaudid® Oral Liquid and Dilaudid® Tablets (8 mg) (hydromorphone hydrochloride) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised October 1999.
82. Duragesic® (Fentanyl Transdermal System) [package insert]. Titusville, NJ: Janssen Pharmaceutica Products, LP; revised January 2000 and February 2001.
83. Percolone® (oxycodone hydrochloride) Tablets [package insert]. Chadds Ford, PA: Endo Pharmaceuticals, Inc; revised September 1999.
84. OxyContin® (oxycodone controlled-release) Tablets [package insert]. Stamford, CT: The Purdue Frederick Company; June 6, 2000.
85. Tylox® Capsules (oxycodone and acetaminophen) [package insert]. Spring House, PA: McNeilLab, Inc; revised June 1997.
86. Percocet® (oxycodone HCl and acetaminophen) Tablets [package insert]. Chadds Ford, PA: Endo Pharmaceuticals, Inc; revised January 2000.
87. Percodan® (oxycodone and aspirin) Tablets [package insert]. Chadds Ford, PA: Endo Pharmaceuticals, Inc; revised November 1999.
88. Demerol® (meperidine hydrochloride) Tablets [package insert]. New York, NY: Sanofi-Synthelabo Inc; September 2000.
89. Vicodin HP® (hydrocodone bitartrate and acetaminophen tablets) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised May 2000.
90. Vicodin® (hydrocodone bitartrate and acetaminophen tablets) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised May 2000.
91. Vicodin ES® Tablets (hydrocodone bitartrate and acetaminophen tablets) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised May 2000.
92. Vicoprofen® (hydrocodone bitartrate and ibuprofen tablets) [package insert]. Mount Olive, NJ: Knoll Pharmaceutical Company; revised May 2000.
93. Lortab® (2.5/500, 5/500, 7.5/500, 10/500) Tablets and Lortab® Elixir (hydrocodone bitartrate and acetaminophen) [package insert]. Smyrna, GA: UCP Pharma, Inc; no date provided.
94. Codeine Sulfate Tablets [no package insert available]. Columbus, OH: Roxanne Laboratories, Inc.
95. Tylenol® with Codeine (acetaminophen and codeine phosphate) Tablets and Elixir [package insert]. Raritan, NJ: Ortho-McNeil Pharmaceutical, Inc; revised July 2000.
96. Kaiko RF, Foley KM, Grabsinski PY, et al. Central nervous system excitatory effects of meperidine in cancer patients. *Ann Neurol*. 1983;13:180-185.
97. Haddox JD, Joranson D, Angarola RT, et al. The Use of Opioids for the Treatment of Chronic Pain. A consensus statement from the American Academy of Pain Medicine and the American Pain Society. Glenview, IL: American Pain Society; 1997. Available at: <http://www.ampainsoc.org/advocacy/opioids.htm>. Accessed September 2001.
98. Nicholson B. Gabapentin use in neuropathic pain syndromes. *Acta Neurol Scand*. 2000;101(6):359-71. Review.
99. MacDonald RL, Kelly KM. Mechanisms of action of currently prescribed and newly developed antiepileptic drugs. *Epilepsia*. 1994;35(suppl 4):S41-50.
100. Weinberger J, Nicklas WJ, Berl S. Mechanism of action of anticonvulsants. *Neurology (Minneapolis)*. 1976;26:162-173.
101. Covington EC. Anticonvulsants for neuropathic pain and detoxification. *Cleve Clin J Med*. 1998;65(suppl 1):S1-21-S1-29.
102. Swerdlow M, Cundiff JG. Anticonvulsant drugs used in the treatment of lancinating pains: a comparison. *Anesthesia*. 1981;36:1129-1132.
103. Swerdlow M. Anticonvulsant drugs and chronic pain. *Clin Neuropharmacol*. 1984;7:51-82.
104. Max MB, Gilon IH. Antidepressants, muscle relaxants, and N-methyl-D-aspartate receptor antagonists. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1710-1726.
105. Rowbotham MC, Peterson KL. Anticonvulsants and local anesthetics. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1727-1735.
106. Galer B. Topical medication. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1736-1741.
107. Portenoy RK, McCaffery M. Adjuvant analgesics. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:300-361.
108. Kingery WS. A critical review of controlled clinical trials for peripheral neuropathic pain and complex regional pain syndromes. *Pain*. 1997;73(2):123-139.
109. Tremont-Lukats IW, Megeff C, Backonja MM. Anticonvulsants for neuropathic pain syndromes: mechanisms of action and place in therapy. *Drugs*. 2000;60(5):1029-1052.
110. Carter GT, Galer BS. Advances in the management of neuropathic pain. *Phys Med Rehabil Clin N Am*. 2001;12(2):447-459.
111. Backonja MM. Painful neuropathies. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:371-387.
112. Backonja MM. Anticonvulsants (antineuropathics) for neuropathic pain syndromes. *Clin J Pain*. 2000;16(suppl 2):S67-72.
113. Backonja M, Beydoun A, Edwards KR, et al. Gabapentin for the symptomatic treatment of painful neuropathy in patients with diabetes mellitus: a randomized controlled trial. *JAMA*. 1998;280(21):1831-1836.
114. Rowbotham M, Harden N, Stacey B, et al. Gabapentin for the treatment of postherpetic neuralgia: a randomized controlled trial. *JAMA*. 1998;280(21):1837-1842.
115. Magnus-Miller L, Podolnick P, Mathew NT, et al. Efficacy and safety of gabapentin (Neurontin) in migraine prophylaxis [abstract]. 17th American Pain Society Annual Scientific Meeting; San Diego, CA; November 5-8, 1998.
116. Di Trapani G, Mei D, Marra C, et al. Gabapentin in the prophylaxis of migraine: a double-blind randomized placebo-controlled study. *Clin Ter*. 2000;151(3):145-148.
117. Watson CP. The treatment of neuropathic pain: antidepressants and opioids. *Clin J Pain*. 2000;16(suppl 2):S49-55. Review.
118. Bonezzi C, Demartini L. Treatment options in postherpetic neuralgia. *Acta Neurol Scand Suppl*. 1999;173:25-35; discussion 48-52. Review.
119. Beydoun A. Postherpetic neuralgia: role of gabapentin and other treatment modalities. *Epilepsia*. 1999;40(suppl 6):S51-56; discussion S73-74.
120. Magnus L. Nonepileptic uses of gabapentin. *Epilepsia*. 1999;40(suppl 6):S66-72; discussion S73-74.
121. McQuay H, Carroll D, Jadad AR, et al. Anticonvulsant drugs for management of pain: a systemic review. *BMJ*. 1995;311:1047-1052.
122. McQuay HJ, Tramer M, Nye BA, et al. A systematic review of antidepressants in neuropathic pain. *Pain*. 1996;68(2-3):217-227.
123. Sumpton JE, Moulin DE. Treatment of neuropathic pain with venlafaxine. *Ann Pharmacother*. 2001;35(5):557-559.
124. Staab JP, Evans DL. Efficacy of venlafaxine in geriatric depression. *Depress Anxiety*. 2000;12(suppl 1):63-68.
- 124a. Arnold LM, Lu Y, Crofford LJ, et al. A double-blind, multicenter trial comparing duloxetine with placebo in the treatment of fibromyalgia patients with or without major depressive disorder. *Arthritis Rheum*. 2004;50:2974-2984.
- 124b. Brannan SK, Mallinckrodt CH, Brown EB, et al. Duloxetine 60 mg once-daily in the treatment of painful physical symptoms in patients with major depressive disorder. *J Psychiatr Res*. 2005;39:43-53.
- 124c. Goldstein DJ, Lu Y, Detke MJ, et al. Duloxetine vs. placebo in patients with painful diabetic neuropathy. *Pain*. 2005; 116:109-118.
125. Glassman AH, Bigger JT. Cardiovascular effects of therapeutic doses of tricyclic antidepressants. *Arch General Psychiatry*. 1981;38:815-820.
126. Rowbotham MC, Reisman-Kelly LA, Fields HL. Both intravenous lidocaine and morphine reduce the pain of postherpetic neuralgia. *Neurology*. 1991;41:1024-1028.
127. Kastrup J, Petersen P, Dejgard A, et al. Intravenous lidocaine infusion: a new treatment for chronic painful diabetic neuropathy. *Pain*. 1987;28:69-75.
128. Backonja M, Gombar K. Response of central pain syndromes to intravenous lidocaine. *J Pain Symptom Manage*. 1992;7:172-178.
129. Dejgard A, Petersen P, Kastrup J. Mexiletine for treatment of chronic painful diabetic neuropathy. *Lancet*. 1988;1:9-11.
130. Dunlop R, Davies RJ, Hockley F, et al. Letter to the editor. *Lancet*. 1989;1:420-421.
131. Neurontin® (gabapentin) Capsules, Neurontin® (gabapentin) Tablets; Neurontin® (gabapentin) Oral Solution [package insert]. Morris Plains, NJ: Parke-Davis, Division of Warner-Lambert Division, a Pfizer Company; revised February 1999 and November 1999 (Pfizer web site).
132. Tegretol® (carbamazepine) Chewable Tablets, Tablets, Suspension; Tegretol-XR (carbamazepine extended-release tablets) [package insert]. East Hanover, NJ: Novartis Pharmaceuticals Corporation; revised June 2000.
133. Depakote® Tablets (divalproex sodium delayed-release tablets) [package insert]. North Chicago, IL: Abbott Laboratories; revised June 2000.
134. Depakote® ER (divalproex sodium extended-release tablets) [package insert]. North Chicago, IL: Abbott Laboratories; revised August 2000.
135. Dilantin® Kapsels® (extended phenytoin sodium capsules, USP) [package insert]. Morris Plains, NJ: Parke-Davis, Division of Warner-Lambert Division, a Pfizer Company; revised May 1999.
136. Dilantin-125® (Phenytoin Oral Suspension, USP) [package insert]. Morris Plains, NJ: Parke-Davis, Division of Warner Lambert Division, a Pfizer Company; revised May 1999.
137. Elavil® (amitriptyline HCl) Tablets and Injection [package insert]. Wilmington, DE: AstraZeneca Pharmaceuticals LP; revised August 1998.
138. Nortriptyline HCl capsules [no package insert available]. Broomfield, CT: Geneva Pharmaceuticals.
139. Lidoderm® (lidocaine patch 5%) [package insert]. Chadds Ford, PA: Endo Pharmaceuticals; July 1999.
140. EMLA® Anesthetic Disk (lidocaine 2.5% and prilocaine 2.5% cream) Topical Adhesive System, EMLA® Cream (lidocaine 2.5% and prilocaine 2.5%) [package insert]. Wilmington, DE: AstraZeneca LP; revised July 1999.

141. Sensorcaine® (bupivacaine HCl Injection, USP); Sensorcaine®-MPF (bupivacaine HCl and epinephrine Injection, USP); Sensorcaine® with Epinephrine (bupivacaine HCl and epinephrine Injection, USP); Sensorcaine®-MPF with Epinephrine (bupivacaine HCl and epinephrine Injection, USP) [package insert]. Wilmington, DE: AstraZeneca LP; revised March 1997.
142. Xylocaine® (lidocaine HCl Injection, USP); Xylocaine® (lidocaine HCl and epinephrine Injection, USP) [package insert]. Wilmington, DE: AstraZeneca LP; revised April 2000.
- 142a. Lyrica (pregabalin) [package insert]. New York, NY: Pfizer Inc; August 2005.
143. Chadda VS, Mathur MS. Double blind study of the effects of diphenylhydantoin sodium on diabetic neuropathy. *J Assoc Physicians India*. 1978;26:403-406.
144. Lockman LA, Hunningshake DB, Krivit W, et al. Relief of pain of Fabry's disease by diphenylhydantoin. *Neurology*. 1973;23:871-875.
145. Saudek CD, Werns S, Reidenber MM. Phenytoin in the treatment of diabetic symmetrical polyneuropathy. *Clin Pharmacol Ther*. 1977;22:196-199.
146. Backonja M, Beydoun A, Edwards KR, et al. Gabapentin for the symptomatic treatment of painful neuropathy in patients with diabetes mellitus: a randomized controlled trial. *JAMA*. 1998;280(21):1831-1836.
147. Backonja MM. Gabapentin monotherapy for the symptomatic treatment of painful neuropathy: a multicenter, double-blind, placebo-controlled trial in patients with diabetes mellitus. *Epilepsia*. 1999;40(suppl 6):S57-59; discussion S73-74.
148. Merren MD. Gabapentin for treatment of pain and tremor: a large case series. *South Med J*. 1998;91(8):739-744.
149. Weber WE. *Ned Tijdschr Geneesk* [in Dutch]. 2001;145(17):813-817.
150. Block F. Gabapentin therapy for pain. *Nervenarzt*. 2001;72(2):69-77.
- 150a. Freynhagen R, Strojek K, Greising T, et al. Efficacy of pregabalin in neuropathic pain evaluated in a 12-week, randomised, double-blind, multicentre, placebo-controlled trial of flexible and fixed-dose regimens. *Pain*. 2005;115:254-263.
151. Sawynok J, Esser MJ, Reid AR. Antidepressants as analgesics: an overview of central and peripheral mechanisms of action. *J Psychiatry Neurosci*. 2001;26(1):21-29.
152. Yaksh TL. Direct evidence that spinal serotonin and noradrenaline terminals mediate the spinal antinociceptive effects of morphine in the periaqueductal gray. *Brain Res*. 1979;160:180-185.
153. Basbaum AI, Fields HL. Endogenous pain control systems: brainstem spinal pathways and endorphin circuitry. *Annu Rev Neurosci*. 1984;7:309-338.
154. Besson JM, Chaouch A. Peripheral and spinal mechanism of nociception. *Physiol Rev*. 1987;67:67-186.
155. O'Malley PG, Jackson JL, Santoro J, et al. Antidepressant therapy for unexplained symptoms and symptom syndromes. *J Fam Pract*. 1999;48(12):980-990. Review.
156. Kishore-Kuman R, Max MB, Schafer SC, et al. Desipramine relieves postherpetic neuralgia. *Clin Pharmacol Ther*. 1990;47:305-312.
157. Max MB, Culhane M, Schafer SC, et al. Amitriptyline relieves diabetic neuropathy pain in patients with normal or depressed mood. *Neurology*. 1987;37:589-596.
158. Watson CP, Evan RJ, Reed K, et al. Amitriptyline versus placebo in postherpetic neuralgia. *Neurology*. 1982;32:671-673.
159. Max MB, Lynch SA, Muir J, et al. Effects of desipramine, amitriptyline, and fluoxetine on pain in diabetic neuropathy. *N Engl J Med*. 1992;326:1250-1256.
160. Collins SL, Moore RA, McQuay HJ, et al. Antidepressants and anticonvulsants for diabetic neuropathy and postherpetic neuralgia: a quantitative systematic review. *J Pain Symptom Manage*. 2000;20(6):449-458.
161. Morello CM, Leckband SG, Stoner CP, et al. Randomized double-blind study comparing the efficacy of gabapentin with amitriptyline on diabetic peripheral neuropathy pain. *Arch Intern Med*. 1999;159(16):1931-1937.
162. Lynch ME. Antidepressants as analgesics: a review of randomized controlled trials. *J Psychiatr Neurosci*. 2001;26(1):30-36. Review.
163. Davies PS, Reiser-Keller LA, Rowbotham MC. Randomized, double-blind comparison of fluoxetine, desipramine, and amitriptyline in postherpetic neuralgia [abstract]. Abstracts: 8th World Congress on Pain. Seattle, WA: IASP Press;1996.
164. Max MB. Treatment of post-herpetic neuralgia: antidepressants. *Ann Neurol*. 1994;(suppl 35):S50-53. Review.
165. Sindrup SH, Gram LF, Brosen K, et al. The selective serotonin reuptake inhibitor paroxetine is effective in the treatment of diabetic neuropathy symptoms. *Pain*. 1990;42:135-144.
166. Fishbain D. Evidence-based data on pain relief with antidepressants. *Ann Med*. 2000;32(5):305-16. Review.
167. Covino BG. Local anesthetics. In: Ferrante FM, VadeBoncouer TR, eds. *Postoperative Pain Management*. New York: Churchill Livingstone; 1993:211-253.
168. Woolf CJ, Wiesenfeld-Hallin Z. The systemic administration of local anesthetic produces a selective depression of C-afferent evoked activity in the spinal cord. *Pain*. 1985;23:361-374.
169. Chabal C, Russell LC, Burchiel KJ. The effect of intravenous lidocaine, tocainide, and mexiletine on spontaneously active fibers originating in rat sciatic neuromas. *Pain*. 1989;38:333-338.
170. AstraZeneca. Pain control & anesthesia, AstraZeneca products. Available at: [http://www.astrazeneca.com/Products/Pain\\_control\\_and\\_anesthesia\\_products.htm#](http://www.astrazeneca.com/Products/Pain_control_and_anesthesia_products.htm#). Accessed September 2001.
171. Hallen B, Carlsson P, Uppfeldt A. Clinical study of lignocaine-prilocaine cream to relieve the pain of venipuncture. *Br J Anaesth*. 1985;57(3):326-328.
172. Hallen B, Olsson GI, Uppfeldt A. Pain free venipuncture. *Anesthesia*. 1984;39:969-972.
173. Vaghadia H, al Ahdal OA, Nevin K. EMLA patch for intravenous cannulation in adult surgical outpatients. *Can J Anaesth*. 1997;44:798-802.
174. Sharma SK, Gajraj NM, Sidawi JE, et al. EMLA cream effectively reduces the pain of spinal needle insertion. *Reg Anesth*. 1996;21:561-564.
175. Gupta AK, Sibbald RG. Eutectic lidocaine/prilocaine 5% cream and patch may provide satisfactory analgesia for excisional biopsy or curettage with electrosurgery of cutaneous lesions. *J Am Acad Dermatol*. 1996;35:419-423.
176. deWaardvanderSpek FB, Mulder PG, Oranje AP. Prilocaine/lidocaine patch as a local premedication for skin biopsy in children. *J Am Acad Dermatol*. 1997;37:418-421.
177. Argoff CE. New analgesics for neuropathic pain: the lidocaine patch. *Clin J Pain* 2000;16(suppl 2):S62-66.
178. Rowbotham MC, Davies PS, Verkeimpinck C, et al. Lidocaine patch: double-blind controlled study of a new treatment method for post-herpetic neuralgia. *Pain*. 1996;65(1):39-44.
179. Galer BS, Rowbotham MC, Perander J, et al. Topical lidocaine patch relieves postherpetic neuralgia more effectively than a vehicle topical patch: results of an enriched enrollment study. *Pain*. 1999;80(3):533-538.
180. Rowbotham MC, Davies PC, Fields HL. Topical lidocaine gel relieves postherpetic neuralgia. *Ann Neurol*. 1995;37:246-253.
181. Devers A, Galer BS. Topical lidocaine patch relieves a variety of neuropathic pain conditions: an open-label study. *Clin J Pain*. 2000;16(3):205-208.
182. Ray A. Physiology and management of acute pain. 2001 Hospital Consultants Meeting; New Orleans, LA; May 18-21, 2001.
- 182a. Dworkin Rh, Backonja, Rowbotham MC, et al. Advances in neuropathic pain: diagnosis, mechanisms, and treatment recommendations. *Arch Neurol*. 2003;60:1524-1534.
183. Cossman M, Wilsman KM. Effect and side effects of tramadol: an open phase IV study with 7,198 patients. *Tehrapiewoche*. 1987;37:3475-3495.
184. Preston KL, Jasinski DR, Testa M. Abuse potential and pharmacological comparison of tramadol and morphine. *Drug Alcohol Depend*. 1991;27:7-17.
185. Rauck RL, Ruoff GE, McMillen JJ. Comparison of tramadol and acetaminophen with codeine for long-term pain management in elderly patients. *Curr Ther Res*. 1994;55:1417-1431.
186. Raffa RB, Friderichs E, Reimann W, et al. Opioid and nonopioid components independently contribute to the mechanism of action of tramadol, an atypical opioid analgesic. *J Pharmacol Exp Ther*. 1992;260:275-285.
187. Ettinger AB, Portenoy RK. The use of corticosteroids in the treatment of symptoms associated with cancer. *J Pain Symptom Manage*. 1988;3:99-103.
188. Decadron® Elixir (dexamethasone) [package insert]. West Point, PA: Merck & Co, Inc; February 1997.
189. Decadron® Tablets (dexamethasone) [package insert]. West Point, PA: Merck & Co., Inc; February 1997.
190. Decadron® Phosphate Injection (dexamethasone sodium phosphate) [package insert]. West Point, PA: Merck & Co, Inc; July 1999.
191. Methylprednisolone tablets [no package insert available]. Corona, CA: Watson Laboratories.
192. Ultram® (tramadol hydrochloride tablets) [package insert]. Raritan, NJ: Ortho-McNeil Pharmaceutical, Inc; December 1999.
193. Zomig® (zolmitriptan) Tablets [package insert]. Wilmington, DE: AstraZeneca Pharmaceuticals LP; revised May 2000.
194. Maxalt® (rizatriptan benzoate) Tablets, Maxalt-MLT® (rizatriptan benzoate) Orally Disintegrating Tablets [package inserts]. West Point, PA: Merck & Co, Inc; August 1999 and July 2000 (Merck web site).
195. Imitrex® (sumatriptan succinate) Injection [package insert]. Research Triangle Park, NC: Glaxo Wellcome, Inc; September 1999.
196. Imitrex® (sumatriptan) Nasal Spray [package insert]. Research Triangle Park, NC: Glaxo Wellcome, Inc; September 1999.
197. Imitrex® (sumatriptan succinate) Tablets [package insert]. Research Triangle Park, NC: Glaxo Wellcome Inc; September 1999.
- 197a. Axert® (almotriptan maleate) Tablets [package insert]. Raritan, NJ: Ortho-McNeil Pharmaceutical, Inc; August 2004.
- 197b. Relpax® (eletriptan HBr) Tablets [package insert]. New York, NY: Pfizer Inc; May 2004.
- 197c. Frova® (frovatriptan succinate) Tablets. Chadds Ford, PA: Endo Pharmaceuticals Inc; August 2004.
- 197d. Amerge® (naratriptan hydrochloride) Tablets [package insert]. Research Triangle Park, NC: GlaxoSmithKline; May 2003.
198. Inderal® (propranolol hydrochloride) Tablets, Inderal (propranolol hydrochloride) Injectable [package insert]. Philadelphia, PA: Wyeth-Ayerst Laboratories; revised March 17, 1999.
199. Inderal® LA (propranolol hydrochloride) Long-Acting Capsules [package insert]. Philadelphia, PA: Wyeth-Ayerst Laboratories; revised March 17, 1999.

200. Baclofen tablets [no package insert available]. Corona, CA: Watson Laboratories, Inc.
- 200a. Prialt (ziconotide) intrathecal infusion [package insert]. San Diego, CA: Elan Pharmaceuticals, Inc.; December 2004.
201. Institute for Clinical Systems Improvement (ICSI) Work Group. Assessment and Management of Acute Pain. ICSI health care guideline. September 2000.
202. Payne R, Chandler SW, Einhaus E. Guidelines for the clinical use of transdermal fentanyl. *Anticancer Drugs*. 1995;6:50-53.
203. Ahmedzai S, Brooks D, for the TTS-Fentanyl Comparative Trial Group. Transdermal fentanyl versus sustained-release oral morphine in cancer pain: preference, efficacy, and quality of life. *J Pain Symptom Manage*. 1997;13:254-261.
204. Payne R, Mathias SD, Pasta DJ, et al. Quality of life and cancer pain: satisfaction and side effects with transdermal fentanyl versus oral morphine. *J Clin Oncol*. 1998;16:1588-1593.
205. Allen L, Hays H, Jensen NH, et al. Randomised crossover trial of transdermal fentanyl and sustained release oral morphine for treating non-cancer pain. *BMJ*. 2001;322:1-7.
206. Barash PG, Cullen BF, Stoelting RK, eds. *Handbook of Clinical Anesthesia*. 3rd ed. Philadelphia, PA: Lippincott-Raven; 1997.
207. Pasero C, McCaffery M. *Procedural pain management*. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:362-398.
208. White PF. Patient-controlled analgesia, II: comparative studies and alternative routes of administration. In: Stanley TH, Ashburn Ma, Fine PG, eds. *Anesthesiology and Pain Management*. Dordrecht, Netherlands: Kluwer Academic Publishers; 1991:245-248.
209. American Society of Addiction Medicine. Definitions Related to the Use of Opioids for the Treatment of Pain. Consensus document from the American Academy of Pain Medicine, the American Pain Society, and the American Society of Addiction Medicine. February 2001. Available at: <http://www.asam.org>. Accessed June 2001.
210. Bonica JJ, Bendetti C. Management of cancer pain. In: Moosa AR, Robson MC, Schimpff SC, eds. *Comprehensive Textbook of Oncology*. Baltimore, MD: Williams & Wilkins; 1985:443-477.
211. Weissman DE, Burchman SL, Dinndorf PA, et al. *Handbook of Cancer Pain Management*. 2nd ed. Milwaukee, WI: Wisconsin Cancer Pain Initiative; 1990.
212. Wallace K. The pathophysiology of pain. *Crit Care Nurs Q*. 1992;15(2):1-13.
213. Dunajcik L. Chronic nonmalignant pain. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:467-521.
214. Fordyce WE. Operant or contingency therapies. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1745-1750.
215. Chapman CR. Section C. Psychological techniques introduction. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1743-1744.
216. Arena JG, Blanchard EB. Biofeedback therapy for chronic pain disorders. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1759-1767.
217. Barber J. Hypnosis. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1768-1778.
218. Syrjala KL. Relaxation and imagery techniques. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1779-1788.
219. Gottlieb H. Medication nonadherence: finding solutions to a costly medical problem. *Drug Benefit Trends*. 2000;12:57-62.
220. Heavner JE, Shi B, Diede J, et al. Acetaminophen (paracetamol) use and blood concentrations in pain patients. *Pain Dig*. 1996;6:215-218.
221. Burney KD, Krishnan K, Ruff MT, et al. Adherence to single daily dose of aspirin in a chemoprevention trial: an evaluation of self-report and microelectronic monitoring. *Arch Fam Med*. 1996;5:297-300.
222. Chapman CR. Compliance with pain medication: a hidden problem? *APS Bulletin*. 1996;6(6):11.
223. McCaffery M, Pasero C. Practical nondrug approaches to pain. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:399-427.
224. Willick SE, Herring SA, Press JM. Basic concepts in biomechanics and musculoskeletal rehabilitation. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1815-1831.
225. Ramsay DJ, Bowman MA, Greenman PE, et al, for the National Institutes of Health (NIH) Consensus Development Panel. Acupuncture. NIH Consensus Statement Online. November 3-5 1997;15(5):1-34. Available at: [http://odp.od.nih.gov/consensus/cons/107/107\\_statement.htm#8\\_Consen](http://odp.od.nih.gov/consensus/cons/107/107_statement.htm#8_Consen). Accessed September 2001.
226. Osiri M, Welch V, Brosseau L, et al. Transcutaneous electrical nerve stimulation for knee osteoarthritis. *Cochrane Database Syst Rev*. 2000;(4):CD002823. Review.
227. Yurtkuran M, Kocagil T. TENS, electroacupuncture and ice massage: comparison of treatment for osteoarthritis of the knee. *Am J Acupunct*. 1999;27(3-4):133-140.
228. Offenbacher M, Stucki G. Physical therapy in the treatment of fibromyalgia. *Scand J Rheumatol Suppl*. 2000;113:78-85. Review.
229. Patil PG, Campbell JN. Lesions of primary afferent and sympathetic efferents as treatments for pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:2011-2022.

## References Section IV: Management of Acute Pain and Chronic Noncancer Pain

- Jacox AK, Carr DB, Chapman CR, et al. *Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1992. AHCPR publication 92-0032.
- Wilson PR, Caplan RA, Connis RT, et al, of the American Society of Anesthesiologists, Task Force on Pain Management, Chronic Pain Section. Practice guidelines for chronic pain management. *Anesthesiology*. 1997;86(4):995-1004.
- Dahl JB, Rosenberg J, Dirkes WE, et al. Prevention of postoperative pain by balanced analgesia. *Br J Anaesth*. 1990;64:518-520.
- Dahl JB, Kehlet H. Non-steroidal anti-inflammatory drugs: rationale for use in severe postoperative pain. *Br J Anaesth*. 1991;66:703-712.
- Kehlet H, Dahl JB. The value of "multimodal" or "balanced" analgesia in postoperative pain treatment. *Anesth Analg*. 1993;77:1048-1056.
- McCaffery M, Portenoy RK. Overview of three groups of analgesics. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999a:103-128.
- Kehlet H. Postoperative pain relief: what is the issue? *Br J Anaesth*. 1994;72:374-378.
- Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. *Br J Anaesth*. 1997;78:606-617.
- Kehlet H. Acute pain control and accelerated postoperative surgical recovery. *Surg Clin North Am*. 1999;29(2):431-443.
- Reuben SS, Connelly NR. Postoperative analgesic effects of celecoxib or rofecoxib after spinal fusion surgery. *Anesth Analg*. 2000;91(5):1221-1225.
- Bach S, Noreng MF, Tjellden NU. Phantom limb pain in amputees during the first 12 months following limb amputation, after postoperative lumbar epidural blockade. *Pain*. 1988;33:297-301.
- Jahangiri M, Jayatunga AP, Bradley JW, et al. Prevention of phantom pain after major lower limb amputation by epidural infusion of diamorphine, clonidine and bupivacaine. *Ann R Coll Surg Engl*. 1994;76(5):324-326.
- Nikolajsen L, Ilkjaer S, Christensen JH, et al. Randomised trial of epidural bupivacaine and morphine in prevention of stump and phantom pain in lower-limb amputation. *Lancet*. 1997;350:1353-1357.
- Lambert AW, Dashfield AK, Cosgrove C, et al. Randomized prospective study comparing preoperative epidural and intraoperative perineural analgesia for the prevention of postoperative stump and phantom limb pain following major amputation. *Reg Anesth Pain Med*. 2001;26(4):316-321.
- Kehlet H. Preemptive analgesia in postoperative pain: the second round will need a change in tactics. Plenary Session, APS 20th Annual Scientific Meeting, April 26, 2001. Available at: [http://www.ampainsoc.org/meeting/annual\\_01/friday.htm](http://www.ampainsoc.org/meeting/annual_01/friday.htm). Accessed September 2001.
- Katz J. Phantom limb pain. *Lancet*. 1997;350:1338-1339.
- Max MB, Payne R, Edwards WT, et al. *Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain*. 4th ed. Glenview, IL: American Pain Society; 1999.
- Carr DB, Jacox AK, Chapman CR, et al. *Acute Pain Management in Adults: Operative Procedures Quick Reference Guide for Clinicians No. 1a*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; February 1993. AHCPR publication 92-0019.
- Ready BL, Ashburn M, Caplan R, et al, of the American Society of Anesthesiologists, Task Force on Pain Management, Acute Pain Section. Practice guidelines for acute pain management in the perioperative setting. *Anesthesiology*. 1995;82(4):1071-1078.
- Hawkins JL, Arens JF, Bucklin BA, et al, of the American Society of Anesthesiologists Task Force on Obstetrical Anesthesia. Practice guidelines for obstetrical anesthesia. *Anesthesiology*. 1999;90(2):600-611.
- Institute for Clinical Systems Improvement (ICSI) Work Group. Assessment and Management of Acute Pain. ICSI health care guideline. September 2000.
- Ashburn MA, Ready LB. Postoperative pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:765-779.
- Edwards WT. Posttrauma pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:780-787.

24. Patterson DR, Sharar SR. Burn pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:780-787.
25. Moskal MJ, Matsen FA. Orthopedic management of pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1807-1814.
26. Pasero C, McCaffery M. Procedural pain management. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:362-398.
27. McCaffery M, Pasero C. Practical nondrug approaches to pain. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:399-427.
28. Marcus DA. Treatment of nonmalignant chronic pain. *Am Fam Physician*. March 1, 2000;61(5):1331-1338, 1345-1346. Review.
29. Dunajcik L. Chronic nonmalignant pain. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:467-521.
30. Covington EC. Multidisciplinary pain management organization and outcomes [syllabus]. Personal communication, 1999.
31. Flor H, Frych T, Turk DC. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. *Pain*. 1992;49:221-230.
32. Turk DC, Okifuji A. Efficacy of multidisciplinary pain centres: an antidote to anecdotes. *Baillieres Clin Anaesthesiol*. 1998;12:103-119.
33. Commission on Accreditation of Rehabilitation Facilities. 1998 Standards Manual for and Interpretive Guidelines for Medical Rehabilitation. Tucson, AZ: Commission on Accreditation of Rehabilitation Facilities; 1998.
34. Commission on Accreditation of Rehabilitation Facilities. 1999 Standards Manual for and Interpretive Guidelines for Medical Rehabilitation. Tucson, AZ: Commission on Accreditation of Rehabilitation Facilities; 1999.
35. Lipchik GL, Milles K, Covington EC. The effects of multidisciplinary pain management treatment on locus of control and pain beliefs in chronic non-terminal pain. *Clin J Pain*. 1993;9(1):49-57.
36. The Cleveland Clinic Foundation, Rehabilitation Institute. Pain management. Available at: <http://www.clevelandclinic.org/rehab/rb02/02-01b.htm>. Accessed September 2001.
37. The Cleveland Clinic Foundation, Rehabilitation Institute. Special services. Available at: <http://www.clevelandclinic.org/rehab/rb02/02-01.htm>. Accessed September 2001.
38. Rowbotham M, Harden N, Stacey B, et al. Gabapentin for the treatment of postherpetic neuralgia: a randomized controlled trial. *JAMA*. 1998;280(21):1837-1842.
39. Backonja M, Beydoun A, Edwards KR, et al. Gabapentin for the symptomatic treatment of painful neuropathy in patients with diabetes mellitus: a randomized controlled trial. *JAMA*. 1998;280(21):1831-1836.
40. Covington EC. Opioid maintenance in chronic non-malignant pain [syllabus]. Personal communication, September 30, 1999.
41. Haddox JD, Joranson D, Angarola RT, et al. The Use of Opioids for the Treatment of Chronic Pain. A consensus statement from the American Academy of Pain Medicine and the American Pain Society. Glenview, IL: American Pain Society; 1997. Available at: <http://www.ampainsoc.org/advocacy/opioids.htm>. Accessed September 2001.
42. Zenz M, Strumpf M, Tryba M. Long-term oral opioid therapy in patients with chronic nonmalignant pain. *J Pain Symptom Manage*. 1992;7(2):69-77.
43. Schofferman J. Long-term use of opioid analgesics for the treatment of chronic pain of nonmalignant origin. *J Pain Symptom Manage*. 1993;8(5):279-88. Review.
44. Winkelmueller M, Winkelmueller W. Long-term effects of continuous intrathecal opioid treatment in chronic pain of nonmalignant etiology. *J Neurosurg*. 1996;85(3):458-467.
45. Sjogren P, Thunedborg LP, Christrup L, et al. Is development of hyperalgesia, allodynia and myoclonus related to morphine metabolism during long-term administration? Six case histories. *Acta Anaesthesiol Scand*. 1998;42(9):1070-1075.
46. Li X, Angst MS, Clark JD. A murine model of opioid-induced hyperalgesia. *Brain Res Mol Brain Res*. 2001;86(1-2):56-62.
47. Li X, Angst MS, Clark JD. Opioid-induced hyperalgesia and incisional pain. *Anesth Analg*. 2001;93(1):204-209.
48. Portenoy RK. Opioid therapy for chronic nonmalignant pain: current status. In: Fields HL, Liebeskind JC, eds. *Progress in Pain Research and Management*. Vol. 1. Pharmacologic Approaches to the Treatment of Chronic Pain: New Concepts and Critical Issues. Seattle, WA: IASP Press; 1994:274-275.
49. Hochberg MC, Altman RD, Brandt KD, et al, of the Board of Directors, American College of Rheumatology. Guidelines for the medical management of osteoarthritis, part I: osteoarthritis of the hip. *Arthritis Rheum*. 1995;38:1535-1540.
50. Hochberg MC, Altman RD, Brandt KD, et al, of the Board of Directors, American College of Rheumatology. Guidelines for the medical management of osteoarthritis, part II: osteoarthritis of the knee. *Rheum*. 1995;38:1541-1546.
51. Manek NJ, Lane NE. Osteoarthritis: current concepts in diagnosis and management. *Am Fam Physician*. March 15, 2000;61(6):1795-1804. Review.
52. Kwok K, Simms RW, Anderson LG, of the American College of Rheumatology Ad Hoc Committee on Clinical Guidelines. Guidelines for the management of rheumatoid arthritis. *Arthritis Rheum*. 1996;39(5):713-722.
53. Gardner GC, Gilliland BC. Arthritis and periarthritic disorders. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:503-521.
54. Benjamin LJ, Dampier CD, Jacox A, et al. Guideline for the Management of Acute and Chronic Pain in Sickle Cell Disease. Glenview, IL: American Pain Society; August 1999. APS Clinical Practice Guidelines Series No. 1.
55. National Institute of Arthritis and Musculoskeletal and Skin Diseases. Questions and answers about arthritis pain. Available at: <http://www.nih.gov/niams/healthinfo/arthpain.htm>. Accessed February 2001.
56. McCaffery M. Selected pain problems. In: McCaffery M, Pasero C, eds. *Pain Clinical Manual*. 2nd ed. St. Louis, MO: Mosby Inc; 1999:522-607.
57. Institute for Clinical Systems Improvement (ICSI) Work Group. Diagnosis and Treatment of Adult Degenerative Joint Disease (DJD) of the Knee. ICSI health care guideline. November 2000.
58. Institute for Clinical Systems Improvement (ICSI) Work Group. Adult Low Back Pain. ICSI health care guideline. November 1999.
59. Jacox A, Carr DB, Payne R, et al. Clinical Practice Guideline: Management of Cancer Pain. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0592.
60. Bigos S, Bowyer O, Braen G, et al. Acute Low Back Problems in Adults. Guideline No. 14. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 95-0642.
61. Bigos S, Bowyer O, Braen G, et al. Acute Low Back Problems in Adults: Assessment and Treatment Quick Reference Guide No. 14. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 95-0643.
62. Jacox A, Carr DB, Payne R, et al. Management of Cancer Pain: Adults Quick Reference Guide No. 9. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0593.
63. National Institute of Arthritis and Musculoskeletal and Skin Diseases. Questions and answers about fibromyalgia. Available at: <http://www.nih.gov/niams/healthinfo/fibrofs.htm>. Accessed February 2001.
64. Wolfe F, Smythe HA, Yunus MB, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. *Arthritis Rheum*. 1990;34(1):15-21.
65. National Fibromyalgia Partnership. Inc. An overview of the fundamental features of fibromyalgia syndrome. FMS monograph, 1999. Available at: <http://www.fmpartnership.org/engmonog.htm>. Accessed October 2001.
66. Prebost M. Management of pain in sickle cell disease. *Am Fam Physician*. March 1, 2000;61(5):1544, 1549-1550.
67. National Institute of Neurological Disorders and Stroke. Peripheral neuropathy information page. Available at: [http://www.ninds.gov/health\\_and\\_medical/disorders/peripheral\\_neuropathy\\_doc.html](http://www.ninds.gov/health_and_medical/disorders/peripheral_neuropathy_doc.html). Accessed September 2000.
68. Backonja MM. Painful neuropathies. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:371-387.
69. Carter GT, Galer BS. Advances in the management of neuropathic pain. *Phys Med Rehabil Clin N Am*. 2001;12(2):447-459.
70. Backonja MM. Anticonvulsants (antineuropathics) for neuropathic pain syndromes. *Clin J Pain*. 2000;16(suppl 2):S67-72.
71. Morey SS. Guidelines on migraine: part 2. General principles of drug therapy. *Am Fam Physician*. October 15, 2000;62(8):1915-1917.
72. Morey SS. Guidelines on migraine: part 3. Recommendations for individual drugs. *Am Fam Physician*. November 1, 2000;62(9):2145-2148, 2151.
73. Morey SS. Guidelines on migraine: part 4. General principles of preventive therapy. *Am Fam Physician*. November 15, 2000;62(10):2359-2360, 2363.
74. Morey SS. Guidelines on migraine: part 5. Recommendations for specific prophylactic drugs. *Am Fam Physician*. December 1, 2000;62(11):2535-2539. Review.
75. Silberstein SD, for the US Headache Consortium. Practice parameter: evidence-based guidelines for migraine headache (an evidence-based review). *American Academy of Neurology*. *Neurology*. 2000;55:754-763.
76. McCrory DC, Matchar DB, Gray RN, et al. Evidence-based guidelines for migraine headache: overview of program description and methodology. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/public/practiceguidelines/01.pdf>. Accessed October 2001.
77. Ramadan NM, Silberstein SD, Freitag FG, et al. Evidence-based guidelines for migraine headache in the primary care setting: pharmacological management for prevention of migraine. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: [http://www.aan.com/public/practiceguidelines/headache\\_gl.htm](http://www.aan.com/public/practiceguidelines/headache_gl.htm). Accessed October 2001.

78. Matchar DB, Young WB, Rosenberg JH, et al. Evidence based guidelines for migraine headache in the primary care setting: pharmacological management of acute attacks. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: [http://www.aan.com/public/practiceguidelines/headache\\_gl.htm](http://www.aan.com/public/practiceguidelines/headache_gl.htm). Accessed October 2001.
79. Welch KMA. Headache. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:867-895.
80. Institute for Clinical Systems Improvement (ICSI) Work Group. *Migraine Headache*. ICSI health care guideline. May 2000.
81. Lohmander LS, Dalen N, Englund G, et al. Intra-articular hyaluronan injections in the treatment of osteoarthritis of the knee: a randomised, double blind, placebo controlled multicentre trial. Hyaluronan Multicentre Trial Group. *Ann Rheum Dis*. 1996;55:424-431.
82. Adams ME, Atkinson MH, Lussier AJ, et al. The role of viscosupplementation with hylan G-F 20 (Synvisc) in the treatment of osteoarthritis of the knee: a Canadian multicenter trial comparing hylan G-F 20 alone, hylan G-F 20 with non-steroidal anti-inflammatory drugs (NSAIDs) and NSAIDs alone. *Osteoarthritis Cartilage*. 1995;3:213-225.
83. Buckley PF. Regional anesthesia with local anesthetics. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1893-1952.
84. Erjavec M. Epidural steroids for low back pain. In: Loeser JD, Butler SH, Chapman CR, et al, eds. *Bonica's Management of Pain*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001:1557-1562.
85. Buckwalter JA, Lohmander S. Operative treatment of osteoarthritis. Current practice and future development. *J Bone Joint Surg Am*. 1994;76:1405-1418.
86. Lewis C. What to do when your back is in pain. U.S. Food and Drug Administration web site. Available at: [http://www.fda.gov/fdac/features/1998/298\\_back.html](http://www.fda.gov/fdac/features/1998/298_back.html). Accessed February 2001.
87. Bennett RM. The fibromyalgia syndrome: myofascial pain and the chronic fatigue syndrome. In: Kelly WN, Harris ED, Ruddy SE, et al, eds. *Textbook of Rheumatology*. Vol 1. 4th ed. Philadelphia, PA: WB Saunders; 1993:471-479.
88. Campbell, JK, Penzine DB, Wall EM. Evidence-based guidelines for migraine headache: Behavioral and physical treatments. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: [http://www.aan.com/public/practiceguidelines/headache\\_gl.htm](http://www.aan.com/public/practiceguidelines/headache_gl.htm). Accessed October 2001.
89. Poncelet AN. An algorithm for the evaluation of peripheral neuropathy. *Am Fam Physician*. February 15, 1998;57(4):755-764.
90. Osiri M, Welch V, Brosseau L, et al. Transcutaneous electrical nerve stimulation for knee osteoarthritis. *Cochrane Database Syst Rev*. 2000;(4):CD002823. Review.
91. Offenbacher M, Stucki G. Physical therapy in the treatment of fibromyalgia. *Scand J Rheumatol Suppl*. 2000;113:78-85. Review.
8. Max MB, Payne R, Edwards WT, et al. *Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain*. 4th ed. Glenview, IL: American Pain Society; 1999.
9. American Medical Directors Association. *Chronic Pain Management in the Long-Term Care Setting*. Columbia, MD: American Medical Directors Association; 1999.
10. Marcus DA. Treatment of nonmalignant chronic pain. *Am Fam Physician*. March 1, 2000;61(5):1331-1338, 1345-1346. Review.
11. Institute for Clinical Systems Improvement (ICSI) Work Group. *Assessment and Management of Acute Pain*. ICSI health care guideline. October 2002.
12. Jacox A, Carr DB, Payne R, et al. *Clinical Practice Guideline: Management of Cancer Pain*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 94-0592.
13. Bigos S, Bowyer O, Braen G, et al. *Acute Low Back Problems in Adults*. Guideline No. 14. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 95-0642.
14. Hochberg MC, Altman RD, Brandt KD, et al, of the Board of Directors, American College of Rheumatology. *Guidelines for the medical management of osteoarthritis, part I: osteoarthritis of the hip*. *Arthritis Rheum*. 1995;38:1535-1540.
15. Hochberg MC, Altman RD, Brandt KD, et al, of the Board of Directors, American College of Rheumatology. *Guidelines for the medical management of osteoarthritis: part II: osteoarthritis of the knee*. *Arthritis Rheum*. 1995;38:1541-1546.
- 15a. Altman RD, Hochberg MC, Moskowitz RW, et al, of the American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. *Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update*. *Arthritis Rheum*. 2000;43:1905-1915.
16. Kwok K, Simms RW, Anderson LG, of the American College of Rheumatology (ACR) Ad Hoc Committee on Clinical Guidelines. *Guidelines for the management of rheumatoid arthritis*. *Arthritis Rheum*. 1996;39(5):713-722.
- 16a. Kwok CK, Anderson LG, Greene JM, et al, of the American College of Rheumatology Subcommittee on Rheumatoid Arthritis Guidelines. *Guidelines for the management of rheumatoid arthritis: 2002 update*. *Arthritis Rheum*. 2002;46:328-346.
17. Ferrante M, Bedder M, Caplan RA, et al, of the American Society of Anesthesiologists Task Force on Pain Management, Cancer Pain Section. *Practice guidelines for cancer pain management*. *Anesthesiology*. 1996;84:1243-1257.
18. Ramsay DJ, Bowman MA, Greenman PE, et al, for the National Institutes of Health (NIH) Consensus Development Panel. *Acupuncture*. NIH Consensus Statement Online. November 3-5 1997;15(5):1-34. Available at: [http://odp.od.nih.gov/consensus/cons/107/107\\_statement.htm#8\\_Consens](http://odp.od.nih.gov/consensus/cons/107/107_statement.htm#8_Consens).
19. Institute for Clinical Systems Improvement (ICSI) Work Group. *Adult Low Back Pain*. ICSI health care guideline. November 1999.
- 19a. Institute for Clinical Systems Improvement. *Adult low back pain*. Bloomington (MN): Institute for Clinical Systems Improvement; September 2004.
20. Hawkins JL, Arens JF, Bucklin BA, et al, of the American Society of Anesthesiologists Task Force on Obstetrical Anesthesia. *Practice guidelines for obstetrical anesthesia*. *Anesthesiology*. 1999;90(2):600-611.
21. Silberstein EB, Buscombe JR, McEwan A, et al. *Procedure guideline for palliative treatment of painful bone metastases*. Version 3.0. Reston, VA: Society of Nuclear Medicine; January 2003.
22. Poss B, Clark CR, Johnson R, et al, of the American Academy of Orthopaedic Surgeons (AAOS) Task Force on Clinical Algorithms, AAOS Committee on Clinical Policies. *Clinical Guideline on Hip Pain*. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1999.
23. Rosenberg A, Harwin SF, Sculco T, et al, of the American Academy of Orthopaedic Surgeons Task Force on Clinical Algorithms. *Clinical Guideline on Knee Pain*. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1999.
- 23a. American Academy of Orthopaedic Surgeons. *AAOS clinical practice guideline on osteoarthritis of the knee*. Rosemont (IL): American Academy of Orthopaedic Surgeons; 2003.
24. Berger R, Cooney W, Simmons B, et al, of the American Academy of Orthopaedic Surgeons (AAOS) Task Force on Clinical Algorithms, AAOS Committee on Clinical Policies. *Clinical Guideline on Wrist Pain*. Rosemont, IL: American Academy of Orthopaedic Surgeons; 1999.
25. Benjamin, LJ, Dampier CD, Jacox A, et al. *Guideline for the Management of Acute and Chronic Pain in Sickle Cell Disease*. Glenview, IL: American Pain Society; August 1999. APS Clinical Practice Guidelines Series No. 1.
- 25a. Simon LS, Lipman AG, Caudill-Slosberg M, et al. *Guideline for the management of pain in osteoarthritis, rheumatoid arthritis and juvenile chronic arthritis*, 2nd ed. Glenview, IL: American Pain Society; March 2002. APS Clinical Practice Guidelines Series No. 2.
26. McCrory DC, Matchar DB, Gray RN, et al. Evidence-based guidelines for migraine headache: overview of program description and methodology. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/professionals/practice/pdfs/gl0086.pdf>. Accessed August 2, 2005.

## References Section V: Strategies to Improve Pain Management

1. Jacox AK, Carr DB, Chapman CR, et al. *Acute Pain Management: Operative or Medical Procedures and Trauma Clinical Practice Guideline No. 1*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; 1992. AHCPR publication 92-0032.
2. Carr DB, Jacox AK, Chapman CR, et al. *Acute Pain Management in Adults: Operative Procedures Quick Reference Guide for Clinicians No. 1a*. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Policy and Research; February 1993. AHCPR publication 92-0019.
3. Ready BL, Ashburn M, Caplan R, et al, of the American Society of Anesthesiologists Task Force on Pain Management, Acute Pain Section. *Practice guidelines for acute pain management in the perioperative setting*. *Anesthesiology*. 1995;82(4):1071-1078.
4. Gross JB, Bailey PL, Connis RT, et al, of the American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. *Practice guidelines for sedation and analgesia by non-anesthesiologists*. *Anesthesiology*. 2002;96:1004-1017.
5. Wilson PR, Caplan RA, Connis RT, et al, of the American Society of Anesthesiologists Task Force on Pain Management, Chronic Pain Section. *Practice guidelines for chronic pain management*. *Anesthesiology*. 1997;86(4):995-1004.
6. Young D. *Acute Pain Management*. Iowa City, IA: University of Iowa Gerontological Nursing Interventions Center; April 6, 1999. Tittler MG, ed. Research-based protocol No. 1999.
7. American Geriatrics Society. *The management of persistent pain in older persons: AGS panel on persistent pain in older persons*. *J Am Geriatr Soc*. 2002;50(56):205.

27. Campbell JK, Penzine DB, Wall EM. Evidence-based guidelines for migraine headache: Behavioral and physical treatments. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/professionals/practice/pdfs/gl0089.pdf>. Accessed August 2, 2005.
28. Silberstein SD, for the US Headache Consortium. Practice parameter: evidence-based guidelines for migraine headache (an evidence-based review). American Academy of Neurology. *Neurology*. 2000;55:754-763.
29. Frishberg BM, Rosenberg JH, Matchar DB, et al. Evidence-based guidelines for migraine headache: neuroimaging in patients with nonacute headache. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/professionals/practice/pdfs/gl0088.pdf>. Accessed August 2, 2005.
30. Ramadan NM, Silberstein SD, Freitag FG, et al. Evidence-based guidelines for migraine headache in the primary care setting: pharmacological management for prevention of migraine. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/professionals/practice/pdfs/gl0090.pdf>. Accessed August 2, 2005.
31. Matchar DB, Young WB, Rosenberg JH, et al. Evidence based guidelines for migraine headache in the primary care setting: pharmacological management of acute attacks. The U.S. Headache Consortium, American Academy of Neurology. April 2000. Available at: <http://www.aan.com/professionals/practice/pdfs/gl0087.pdf>. Accessed August 2, 2005.
32. Manek NJ, Lane NE. Osteoarthritis: current concepts in diagnosis and management. *Am Fam Physician*. March 15, 2000;61(6):1795-1804. Review.
33. Preboth M. Management of pain in sickle cell disease. *Am Fam Physician*. March 1, 2000;61(5):1544, 1549-1550.
34. Morey SS. Guidelines on migraine: part 2. General principles of drug therapy. *Am Fam Physician*. October 15, 2000;62(8):1915-1917.
35. Morey SS. Guidelines on migraine: part 3. Recommendations for individual drugs. *Am Fam Physician*. November 1, 2000;62(9):2145-2148, 2151.
36. Morey SS. Guidelines on migraine: part 4. General principles of preventive therapy. *Am Fam Physician*. November 15, 2000;62(10):2359-2360, 2363.
37. Morey SS. Guidelines on migraine: part 5. Recommendations for specific prophylactic drugs. *Am Fam Physician*. December 1, 2000;62(11):2535-2539. Review.
38. Institute for Clinical Systems Improvement (ICSI) Work Group. Diagnosis and Treatment of Adult Degenerative Joint Disease (DJD) of the Knee. ICSI health care guideline. November 2000.
- 38a. Institute for Clinical Systems Improvement. Diagnosis and treatment of adult degenerative joint disease (DJD) of the knee. Bloomington (MN): Institute for Clinical Systems Improvement; November 2004.
39. Institute for Clinical Systems Improvement (ICSI) Work Group. Migraine Headache. ICSI health care guideline. May 2000.
- 39a. Boswell MV, Shah RV, Everett CR, et al. Interventional techniques in the management of chronic spinal pain: evidence-based practice guidelines. *Pain Phys*. 2005;8:1-47.
- 39b. Institute for Clinical Systems Improvement. Diagnosis and treatment of headache. Bloomington (MN): Institute for Clinical Systems Improvement; November 2004.
- 39c. Dubinsky RM, Kabbani H, El-Chami Z, et al. Practice parameter: treatment of postherpetic neuralgia: an evidence-based report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*. 2004;63:959-965.
- 39d. Lewis D, Ashwal S, Hershey A, et al. Practice parameter: pharmacological treatment of migraine headache in children and adolescents: report of the American Academy of Neurology Quality Standards Subcommittee and the Practice Committee of the Child Neurology Society. *Neurology*. 2004;63:2215-2224.
- 39e. American Pain Society. Guideline for the management of fibromyalgia syndrome pain in adults and children. Glenview, IL:2005.
- 39f. Freitag FG, Lake A 3rd, Lipton R, et al. Inpatient treatment of headache: an evidence-based assessment. *Headache*. 2004;44:342-360.
- 39g. American Academy of Pediatrics Subcommittee on Chronic Abdominal Pain. Chronic abdominal pain in children. *Pediatrics*. 2005;115:812-815.
- 39h. US Preventive Services Task Force. Primary care interventions to prevent low back pain in adults: recommendation statement. *Am Fam Physician*. 2005;71:2337-2338.
40. Pellegrini JE, Paice J, Faut-Callahan M. Meperidine utilization and compliance with Agency for Health Care Policy and Research guidelines in a tertiary care hospital. *CRNA*. 1999;10(4):174-180.
41. Carr DB, Miaskowski C, Dedrick SC, et al. Management of perioperative pain in hospitalized patients: a national survey. *J Clin Anesth*. 1998;10(1):77-85.
42. Data from multihospital study show low compliance with pain management protocols. *Data Strateg Benchmarks*. June 1999;3(6):91-93.
43. Cleeland CS, Gonin R, Hatfield AK, et al. Pain and its treatment in outpatients with metastatic cancer. *N Engl J Med*. 1994 3;330(9):592-596.
44. Cleeland CS, Gonin R, Baez L, et al. Pain and treatment of pain in minority patients with cancer. The Eastern Cooperative Oncology Group Minority Outpatient Pain Study. *Ann Intern Med*. 1997;127(9):813-816.
45. Stratis Health. Stratis Health-Medicare Health Care Quality Improvement Project: Cancer Pain Assessment and Management in the Hospital Setting. Bloomington, MN: Stratis Health; 1997.
46. Rischer JB, Childress SB. Cancer pain management: pilot implementation of the AHCPR guideline in Utah. *Jt Comm J Qual Improv*. 1996; 22(10):683-700.
47. Du Pen SL, Du Pen AR, Polissar N, et al. Implementing guidelines for cancer pain management: results of a randomized controlled clinical trial. *J Clin Oncol*. 1999;17(1):361-370.
48. Harwood KJ, Nordin M, Heibert R, et al. Low back pain assessment training of industry-based physicians. *J Rehabil Res Dev*. 1997;34(4):371-382.
49. Joint Commission on Accreditation of Healthcare Organizations. Pain management standards. Effective January 1, 2001. Available at: [http://www.jcaho.org/standard/pain\\_hap.html](http://www.jcaho.org/standard/pain_hap.html). Accessed September 2001.
50. Gordon DB, Dahl JL, Stevenson KK. Introduction. In: Gordon DB, Dahl JL, Stevenson KK, eds. Building an Institutional Commitment to Pain Management. The Wisconsin Resource Manual. 2nd ed. Madison, WI: University of Wisconsin-Madison Board of Regents; 2000.
51. American Pain Society Quality of Care Committee. Quality improvement guidelines for the treatment of acute pain and cancer pain. *JAMA*. 1995; 273:1874-1880.



## POSTTEST QUESTIONS

To obtain 4 hours of CE credit for *Pain: Current Understanding of Assessment, Management, and Treatments*, download the following:

1. Posttest questions
2. Enrollment form
3. Answer sheet
4. CME assessment questions

Forms 2, 3, and 4 should be completed and returned to the American Pain Society via mail or fax. A statement of credit will be generated upon achieving a passing grade of 70% or better. There is no charge for the processing of this CE program.

### Learning Objectives

After reading this monograph, the participant should be able to:

1. Describe the current status of pain management in the United States, barriers to appropriate assessment and management of pain, and consequences of undertreatment of pain.
2. Explain the pathophysiologic mechanisms involved in pain perception.
3. Name elements of the pain assessment process, a tool used for pain assessment, and strategies for overcoming barriers to pain assessment.
4. List the types of pharmacotherapies used to manage pain and compare the mechanisms of action, uses, dosage forms, routes of administration, dosages, and side effects of the various options.
5. Discuss the role of nonpharmacologic interventions in treating pain and name a clinical use for a nonpharmacologic treatment.

#### 1. Which of the following statements best characterizes the current status of pain management in the United States?

- a. Knowledge of pain management strategies is sufficient to manage acute and cancer pain in most patients, but resources are lacking.
- b. Resources are sufficient to manage acute and cancer pain in most patients, but knowledge of pain management strategies is lacking.
- c. Knowledge and resources are sufficient to manage acute and cancer pain in most patients with acute or cancer pain.
- d. Knowledge and resources are sufficient to manage acute and cancer pain in only about half of patients.
- e. Currently available analgesics are inadequate for managing acute and cancer pain, and new agents are needed.

#### 2. The conversion of energy from a noxious thermal, mechanical, or chemical stimulus into electrical energy by nociceptors is known as:

- a. Transduction.
- b. Transmission.
- c. Perception.
- d. Modulation.
- e. Nociception.

#### 3. Which of the following is a physiologic consequence of undertreatment of pain?

- a. Impaired immune function.
- b. Increased rate of gastric emptying.
- c. Decreased heart rate.
- d. Impaired renal function.
- e. Decreased respiratory rate.

#### 4. Barriers to the appropriate assessment and management of pain include:

- a. Financial constraints at health care systems.
- b. Clinicians' lack of concern about pain.
- c. Fear of iatrogenic addiction.
- d. Restrictive laws about patient privacy.
- e. Patients' inability to accurately assess their pain.

#### 5. Addiction is best described as:

- a. A state of adaptation that manifests as a withdrawal syndrome associated with abrupt drug cessation or rapid dose reduction.
- b. A state of adaptation in which exposure to a drug induces changes that result in a diminution of one or more of the drug's effects over time.
- c. A state of adaptation in which exposure to a drug induces changes that result in an increase in one or more of the drug's effects over time.
- d. A primary, chronic neurobiological disease characterized by tolerance.
- e. A primary, chronic neurobiological disease characterized by impaired control over drug use, compulsive use, continued use despite harm, or craving.

#### 6. The single most reliable indicator of pain is:

- a. A healthcare professional's subjective assessment of pain.
- b. The patient's subjective self-report of pain.
- c. An objective measure of pain, such as abnormal vital signs.
- d. The lack of response to placebo.
- e. The presence of an obvious physical cause.

- 7. Which of the following pairs of systems often receive special attention during a physical examination of a patient with pain?**
- Cardiovascular and respiratory.
  - Cardiovascular and renal.
  - Gastrointestinal and endocrine.
  - Musculoskeletal and endocrine.
  - Musculoskeletal and neurological.
- 8. Which of the following is a unidimensional tool for pain assessment?**
- Brief Pain Inventory.
  - Initial Pain Assessment Tool.
  - McGill Pain Questionnaire.
  - Neuropathic Pain Scale.
  - Visual Analog Scale.
- 9. Which of the following pain assessment tools is multidimensional?**
- Brief pain inventory.
  - Faces pain scale.
  - Numeric rating scale.
  - Visual analog scale.
  - Wong-Baker faces Rating Scale.
- 10. Which of the following frequencies for pain reassessment was recommended in the 1992 Agency for Health Care Policy and Research CPG?**
- Within 5 minutes after parenteral drug administration.
  - Within 30 minutes after parenteral drug administration.
  - Within 60 minutes after parenteral drug administration.
  - Within 5 minutes after oral drug administration.
  - Within 30 minutes after oral drug administration.
- 11. Which of the following factors increases the risk for renal adverse effects from NSAIDs?**
- Advanced age.
  - Concomitant use of medications that affect CNS function.
  - Concomitant use of anticoagulants.
  - History of alcoholism.
  - History of sensitivity to aspirin.
- 12. Which of the following adverse effects from nonselective NSAIDs may be minimized by using a selective COX-2 inhibitor?**
- Bleeding from an antiplatelet effect.
  - CNS dysfunction.
  - Hypersensitivity reactions.
  - Renal insufficiency.
  - Liver dysfunction.
- 13. Which of the following medications is a selective COX-2 inhibitor?**
- Diclofenac.
  - Diflunisal.
  - Indomethacin.
  - Ketorolac.
  - Celecoxib.
- 14. Which of the following class side effects of NSAIDs are the main reason for removing the selective COX-2 inhibitors rofecoxib and valdecoxib from the market?**
- Renal insufficiency and GI bleeding.
  - Heart failure and renal failure.
  - Myocardial infarction and stroke.
  - Hypersensitivity and stroke.
  - Renal failure and hypersensitivity.
- 15. The dosage ceiling for a nonopioid is:**
- The highest dosage beyond which no increase in side effects but an increase in pain relief occurs.
  - The highest dosage beyond which no increase in pain relief or side effects occurs.
  - The highest dosage beyond which an increase in side effects but no increase in pain relief occurs.
  - The lowest dosage beyond which a decrease in side effects without a decrease in pain relief occurs.
  - The lowest dosage beyond which a decrease in pain relief but no decrease in side effects occurs.
- 16. Which of the following is a disadvantage of acetaminophen?**
- The risk of gastrointestinal ulcers.
  - The risk of bleeding from an antiplatelet effect.
  - The negligible anti-inflammatory activity.
  - The delay of at least 1-2 weeks before an anti-inflammatory effect is seen.
  - The risk of hypersensitivity reactions.

- 17. Which of the following statements about opioids is correct?**
- They have fallen out of favor because other more effective analgesics are available.
  - They have fallen out of favor because of concerns about the risk of abuse.
  - They play a major role in treating acute, breakthrough, cancer, and some types of chronic noncancer pain.
  - They play a limited role in treating acute and cancer pain that does not respond to other analgesics.
  - They play a limited role in treating cancer pain when concerns about the risk of abuse are moot.
- 18. Which of the following approaches to dosing is recommended when opioids are used for continuous pain?**
- Use by a parenteral route of administration whenever possible.
  - Administration only as needed for pain.
  - Administration around the clock.
  - Use of large initial doses to provide prompt relief followed by gradual dosage decreases based on response.
  - Use of a short-acting drug.
- 19. Which of the following side effects from opioids tends to persist despite continued use of the drugs?**
- Sedation.
  - Nausea and vomiting.
  - Constipation.
  - Urinary retention.
  - Pruritus.
- 20. Which of the following medications should be used to manage nausea from slowed gastric motility during opioid therapy?**
- Hydroxyzine.
  - Metoclopramide.
  - Naloxone.
  - Ondansetron.
  - Prochlorperazine.
- 21. Which of the following approaches is recommended for managing side effects from opioids?**
- Discontinue the opioid if side effects develop.
  - Treat the side effects if they develop.
  - Switch to another opioid if side effects develop.
  - Switch to another route of administration if side effects develop.
  - Use the opioid in combination with an opioid-sparing drug (i.e., a nonopioid) to prevent side effects.
- 22. For which of the following types of pain are antiepileptic drugs most commonly used?**
- Acute pain.
  - Cancer pain.
  - Chronic pain syndrome.
  - Neuropathic pain.
  - Nociceptive pain.
- 23. Which of the following antiepileptic drugs is approved by FDA for preventing migraine headache?**
- Carbamazepine.
  - Divalproex sodium.
  - Gabapentin.
  - Phenobarbital.
  - Phenytoin.
- 24. Which of the following statements about the use of antidepressants for pain management is correct?**
- They relieve pain primarily in patients with depression.
  - They relieve pain at higher doses than those used for an antidepressant effect.
  - They may relieve pain by reducing membrane excitability and suppressing abnormal discharges in pathologically altered neurons.
  - They may relieve pain by blocking receptors for serotonin and norepinephrine in the CNS.
  - They may relieve pain by blocking the reuptake of serotonin and norepinephrine in the CNS.
- 25. Which of the following side effects is most likely to occur and pose a problem for an elderly patient receiving tricyclic antidepressants?**
- Anticholinergic effects.
  - Ataxia.
  - Nystagmus.
  - Pruritus.
  - Thrombocytopenia.
- 26. Which of the following local anesthetics is appropriate to use for relieving acute pain associated with needle insertion or intravenous cannulation?**
- Epidural bupivacaine.
  - Local infiltration of lidocaine.
  - Lidocaine by IV infusion.
  - Topical EMLA.
  - EMLA by IV infusion.

- 27. Which of the following drugs is most useful for treating cancer pain (in combination with other analgesics)?**
- Beta blockers.
  - Capsaicin.
  - Corticosteroids.
  - GABA<sub>B</sub> receptor agonists.
  - Selective 5-HT<sub>1B/1D</sub> receptor agonists.
- 28. Which of the following is a disadvantage of the intramuscular route of administration for analgesics?**
- Short duration of action.
  - Inconsistent blood concentrations.
  - Numbness at the injection site.
  - Risk of abuse.
  - Risk of infection.
- 29. Which of the following therapies is potentially the most critical for patients with chronic noncancer pain?**
- Occupational therapy.
  - Patient education.
  - Physical therapy.
  - Psychological approaches (e.g., relaxation, biofeedback).
  - Treatment of coexisting psychological disorders.
- 30. Which of the following is considered multimodal therapy?**
- Use of an injectable opioid and an oral opioid.
  - Use of a long-acting oral opioid and a short-acting oral opioid.
  - Use of an injectable opioid and regional anesthesia.
  - Use of a nonselective NSAID and a selective COX-2 inhibitor.
  - Use of physical therapy and occupational therapy.
- 31. Which of the following medications are recommended as adjuvant agents for the management of pain in patients with sickle cell anemia?**
- Antiepileptic drugs.
  - Local anesthetics.
  - Muscle relaxants.
  - Sedatives.
  - Tricyclic antidepressants.
- 32. Which of the following treatments is recommended for a patient with chronic arthritis pain?**
- Acetaminophen.
  - Selective 5-HT<sub>1B/1D</sub> receptor agonists.
  - Tricyclic antidepressants.
  - Antiepileptic drugs.
  - Local anesthetics.
- 33. For which of the following painful conditions might acupuncture be used?**
- Cancer pain.
  - Low back pain.
  - Migraine headache.
  - Peripheral neuropathy.
  - Tension headache.
- 34. Which of the following is among the nonpharmacologic interventions recommended for patients with acute pain from trauma?**
- Acupuncture.
  - Application of cold.
  - Biofeedback.
  - Counterirritation.
  - Massage.
- 35. Which of the following groups recently introduced standards for pain management that have attracted the most attention?**
- AHCPR.
  - APS.
  - ASA.
  - JCAHO.
  - NCQA.

### Answer Sheet

To receive four hours of continuing education credit for successful completion of this program, you must mail or fax your completed answer sheet along with the enrollment form and evaluation to:

American Pain Society, Continuing Education  
4700 West Lake Avenue  
Glenview, IL 60025-1485  
(877) 734-8758 (Toll Free Fax)  
(732) 460-7318 (International Fax)

Certificates will be issued to those who score 70% or higher. Those who score below 70% will be notified, and no credit will be recorded.

*Allow 4 weeks for processing.*

I hereby certify that I have completed this activity in its entirety and have taken this test:

\_\_\_\_\_  
(Signature)

- |   |   |
|---|---|
| <b>1.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>18.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>2.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>19.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>3.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>20.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>4.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>21.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>5.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>22.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>6.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>23.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>7.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>24.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>8.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>25.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>9.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E  | <b>26.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>10.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>27.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>11.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>28.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>12.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>29.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>13.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>30.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>14.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>31.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>15.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>32.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>16.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>33.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
| <b>17.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E | <b>34.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |
|   | <b>35.</b> <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E |

In order to receive credit, please complete and return this program assessment form.

## PROGRAM ASSESSMENT

1. To what degree were you able to meet the learning objectives of this program?

- completely
- mostly
- somewhat
- slightly
- not at all

2. How would you rate the content of this program?

- very good
- good
- average
- poor
- very poor

3. How relevant was the content of this program to your practice?

- completely
- mostly
- somewhat
- slightly
- not at all

4. How difficult was it to use and complete this program?

- very
- moderately
- average
- slightly
- not at all

5. How would you rate this program overall?

- very good
- good
- average
- poor
- very poor

6. How would you rate the level of this program?

- basic
- appropriate
- complex

7. How would you rate the length of this program?

- short
- appropriate
- long

8. To what degree was this program free of commercial bias?

- completely
- mostly
- somewhat
- slightly
- not at all

9. To what degree were you able to meet each of the learning objectives for this activity?

**Learning Objective 1:**

Describe the current status of pain management in the United States, barriers to appropriate assessment and management of pain, and consequences of undertreatment of pain.

- completely
- mostly
- somewhat
- slightly
- not at all

**Learning Objective 2:**

Explain the pathophysiologic mechanisms involved in pain perception.

- completely
- mostly
- somewhat
- slightly
- not at all

**Learning Objective 3:**

Name elements of the pain assessment process, a tool used for pain assessment, and strategies for overcoming barriers to pain assessment.

- completely
- mostly
- somewhat
- slightly
- not at all

**Learning Objective 4:**

List the types of pharmacotherapies used to manage pain and compare the mechanisms of action, uses, dosage forms, routes of administration, dosages, and side effects of the various options.

- completely
- mostly
- somewhat
- slightly
- not at all

**Learning Objective 5:**

Discuss the role of nonpharmacologic interventions in treating pain and name a clinical use for a nonpharmacologic treatment.

- completely
- mostly
- somewhat
- slightly
- not at all

10. Comments:

---



---



---



---



---



---



---



---











Sponsored by  
the American Pain Society



4700 West Lake Avenue  
Glenview, IL 60025-1485  
[www.ampainsoc.org](http://www.ampainsoc.org)



NATIONAL  
PHARMACEUTICAL  
COUNCIL, INC

This activity was supported  
by an educational grant  
from the National  
Pharmaceutical Council.

1894 Prestin White Drive  
Reston, VA 20191  
[www.npcnow.org](http://www.npcnow.org)

Release date: May 2006  
Expiration date: May 2007

Pain: Current Understanding of Assessment, Management, and Treatments