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UPDATES ON MANAGING ACUTE AND CHRONIC PAIN IN PRIMARY CARE PRACTICE

OPTIMIZING PAIN REDUCTION, MINIMIZING ADVERSE EVENTS

Presentations from a symposium held in conjunction with the AAPA Annual Conference, San Antonio, Texas, May 2008

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PROGRAM OBJECTIVES

After taking part in this educational activity, participants should be better able to:

- Define acute and chronic pain
- Analyze the role of chronic opioid therapy
- Implement techniques to overcome barriers to chronic opioid therapy
- Assess aberrant drug-taking behaviors
- Describe new ideas related to the pathophysiology of acute muscle spasm
- Appraise new treatment options for acute pain
- Discuss future medication and technology for acute pain across the spectrum of patients

NEEDS ASSESSMENT

Acute and chronic pain have far-reaching effects that extend beyond the physical consequences to encompass psychological issues. Moderate to severe pain may interfere with enjoyment, work, and socialization; interrupt sleep or make it difficult to sleep; affect ability to concentrate, perform everyday tasks, and cope with stress; and cause loss of appetite, feelings of weakness, and depression. Pain is subjective and may be experienced as a prick, tingle, sting, burn, or ache. Pain affects 76.2 million Americans—more than diabetes, heart disease, and cancer combined[1]—and involves an intricate interplay between neurotransmitters, which transmit nerve impulses from one cell to another.[2] Of the estimated 115.3 million hospital emergency department visits in the United States in 2005, nearly one-fifth were for abdominal pain, chest pain, fever, and cough.[3] Abdominal pain was most prevalent in those 22 to 49 years old; chest pain occurred most frequently in those 50 to 64 years old; and upper respiratory tract infection (excluding pharyngitis) was most frequent in those 12 years of age and younger.[3] The estimated annual financial burden of pain in the US resulting from health-care expenses, lost income, and lost productivity is $100 billion.[4]

Specific causes of pain are difficult to pinpoint, but various types of pain have been identified. Nociceptive pain results from an injury to body tissues; neuropathic pain is caused by abnormalities in the nerves, spinal cord, or brain; visceral pain stems from organ damage; and psychogenic pain is related, at least in part, to a psychological disorder.[5] Untreated or undertreated acute pain may result in chronic pain.[6]

The goals of pain treatment are to reduce pain, improve functioning, and enhance quality of life.[7] Since pain affects the whole body, interventions—including pharmacotherapy, psychosocial and rehabilitation techniques, complementary and alternative medicine, surgery, and exercise—are directed toward the individual's entire well-being.

As the population in the US has grown older and national campaigns to increase pain awareness have become more successful, the use of pain medications, including opioids, has risen.[8] Every therapeutic class of drugs, regardless of the disease or condition it treats, is associated with side effects. However, drugs with different modes of administration, such as a topical non-steroidal anti-inflammatory drug (NSAID) given as a transdermal patch or gel that delivers drugs locally to targeted areas, may provide a benefit for patients with acute or chronic pain who have difficulty swallowing or for elderly patients for whom gastrointestinal effects of the systemic NSAIDs may be a concern. Opioids, which provide relief of moderate to severe pain, may be administered via many routes (oral, rectal, intravenous, or subcutaneous) and can be given with adjuvant analgesics.[7] New therapies are being developed to deter abuse associated with the opioids while maintaining their safety and efficacy for pain relief. Short-acting opioids are generally used for acute or intermittent pain, while long-acting opioids are appropriate for chronic pain.[9,10]

Because physician assistants are often the first health-care professionals to diagnose, treat, and prescribe for patients who present with pain, they need to be familiar with the various types of pain and available treatments.

This monograph will educate physician assistants about the available and evolving therapies for conquering pain. Tailoring pain management to the individual patient may require that the physician assistant change treatments or use combination treatment approaches over time. Once pain is controlled, it is important that the physician assistant prevent it from returning or becoming exacerbated so that the patient's quality of life can be maintained.

References

1. American Pain Foundation. Pain Facts & Figures. Available at: http://www.painfoundation.org/page.asp?file=Newsroom?PainFacts.htm. Accessed September 6, 2007.
2. National Institute of Neurological Disorders and Stroke (NINDS). Pain: Hope Through Research. Available at: http://www.ninds.nih.gov/disorders/ chronic_pain/ detail_chronic_pain.htm. Accessed August 31, 2007.
3. Nawar EW, Niska RW, Xu J. National Hospital Ambulatory Medical Care Survey: 2005 Emergency Department Summary. Advance data from Vital and Health Statistics; no. 386. Hyattsville, MD: National Center for Health Statistics; 2007.
4. National Institutes of Health. NIH Guide: New Directions in Pain Research I. September 4, 1998. Available at: http://grants.nih.gov/grants/guide/pa-files/PA-98-102.html. Accessed September 11, 2007.
5. Merck Manual Home Edition. Types: Pain. Available at: http://www.merck.com/mmhe/sec06/ch078/ch078c.html. Accessed August 31, 2007.
6. Petersen-Felix S, Curatolo M. Neuroplasticity—an important factor in acute and chronic pain. *Swiss Med Wkly*. 2002;132:273-278.
7. American Pain Foundation. Treatment Options: A Guide for People Living with Pain. Available at: www.painfoundation.org. Accessed September 4, 2007.
8. Kuehn BM. Opioid prescriptions soar. *JAMA*. 2007;297:249-251.
9. American Academy of Family Physicians. Chronic Pain: How to Get Relief. Available at: http://familydoctor.org/online/famdocen/home/common/pain/disorders/551.printerview.html. Accessed August 31, 2007.
10. McCarberg BH, Barkin RL. Long-acting opioids for chronic pain: pharmacotherapeutic opportunities to enhance compliance, quality of life, and analgesia. *Am J Ther.* 2001; 8:181-186.

TARGET AUDIENCE

The target audience for this activity is physician assistants and other health-care professionals.

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UPDATES ON MANAGING ACUTE AND CHRONIC PAIN IN PRIMARY CARE PRACTICE

OPTIMIZING PAIN REDUCTION, MINIMIZING ADVERSE EVENTS

Updates on Managing Acute and Chronic Pain in Primary Care Practice: Optimizing Pain Reduction, Minimizing Adverse Events is an educational monograph based on material presented at a satellite symposium to the American Academy of Physician Assistants (AAPA) 36th Annual Conference held on May 27, 2008, in San Antonio, Texas. This monograph is intended for physician assistants and other clinicians who treat patients with pain.

Each year 76.5 million Americans suffer from pain that lasts at least 24 hours, according to the National Center for Health Statistics.[1] Pain exacts a terrible toll in terms of diminished quality of life and productivity, and it is the most common cause of long-term disability.[2] The annual cost of pain, including health-care expenses, lost income, and lost productivity, is $100 billion.[3]

PAIN PHYSIOLOGY

Acute pain is associated with an injury that resolves when healing occurs, usually in fewer than 3 months.[4,5] In contrast, chronic pain persists for a month or more after an injury would be expected to heal, and typically lasts longer than 3 to 6 months.[6] However, duration is not the only difference between acute and chronic pain. In chronic pain, repetitive pain signals induce physiochemical changes to neural pathways, making them hypersensitive to input. Over time the signals can become embedded in the spinal cord like a painful memory that is replayed.[2] Hypersensitivity in the spinal cord and memory in the brain may use similar chemical pathways (***Figure 1***).[2]

Most pain, or nociception, begins with tissue injury, which stimulates an inflammatory response that triggers pain signal transmission to the brain.[2,7] Unmyelinated nerves, known as nociceptors or C-fibers, carry the signals to the dorsal horn of the spinal cord where they synapse with second-order nociceptive neurons.[2,8,9] Pain signals ascend the spinothalamic tract to the cerebral cortex to be processed and interpreted.[2,8]

Local reactions at the site of the injury include erythema and swelling.[10] These normal physiologic responses to injury are intended to promote rest and guarding of the injury, which speeds healing. In some cases this initial inflammatory process can result in dysfunction and prolonged disability. Even in patients who have had chronic pain for years, there is often an initiating acute event that went through an inflammatory process and eventually evolved into a persistent problem. It is now thought that effective treatment of acute pain may prevent the development of chronic pain syndromes.[11]

The body's nociceptive system is counterbalanced by an an-

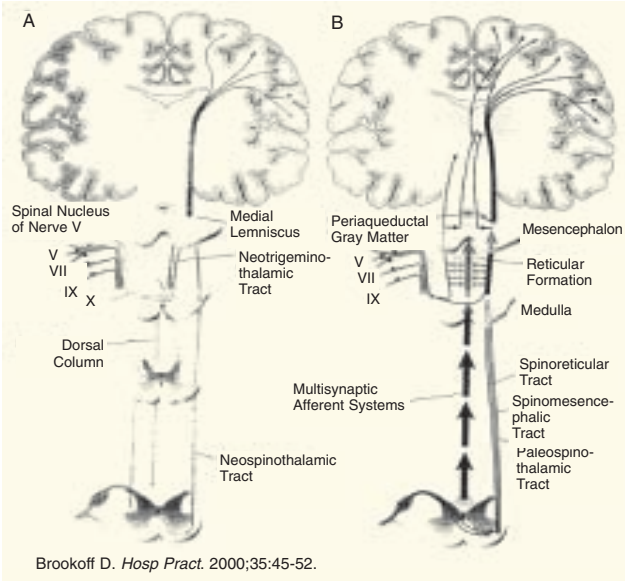

FIGURE 1. Main pain signal pathways to the brain: (A) The lateral system contains long, thick fibers that transmit information about onset of injury, precise location, and intensity. The lateral system fibers carry the rapid flow of pain signals to the thalamus to stimulate an immediate antinociceptive response. (B) The medial system contains fibers that carry slower signals and transmit information related to the persistence of injury and level of response induced.

tinociceptive system. Endorphins, found in the periaqueductal gray matter of the brain, and enkephalins, found in the nucleus raphe magnus of the brainstem, are released in response to incoming nociceptive signals.[2,9] These endogenous peptides, the endorphins and enkephalins, inhibit the nociceptive signals. Other chemicals known to moderate pain signals are gamma-aminobutyric acid (GABA), oxytocin, relaxin, and norepinephrine.[2]

The nociceptive and antinociceptive systems act in concert to alert the body to dangers, while reducing injury, minimizing disabling pain, and preserving function. An imbalance in these systems can result in pain that serves no beneficial purpose. Multiple receptors are involved in nociceptive transmission. Neurotransmitters, such as glutamate, can activate the NMDA (**N**-**m**ethyl-**D**-**a**spartate) receptors and AMPA (alpha-**a**mino-3-hydroxy-5-**m**ethyl-isoxazole-4-**p**ropionic-**a**cid) receptors. With repeated stimulation of the AMPA receptors, the NMDA receptors become primed after an intra-receptor magnesium ion is displaced. With activation of the NMDA receptors, neurons can depolarize and relay pain information with less peripheral input, a phenomenon known as windup.[2] As a consequence, more antinociception is required to manage the increase in nociception. Eventually the body's endogenous pain relievers, including endorphins, are unable to keep pace with the demand, which results in chronic, nonbeneficial pain.[2] Other mediators, such as bradykinin, some prostaglandins, and leukotrienes contribute to the process of sensitization.[8]

Nociceptive pain is involved in injuries from sprains, fractures, wounds, burns, and inflammatory insults.[12] It is often described as throbbing, aching, or sharp, and usually results from direct tissue trauma, such as surgical procedures or injury. Not all pain is nociceptive.

Neuropathic pain results from direct damage to the nerves, and is often described as burning, tingling, electrical, or lancinating. In the setting of nerve injury, receptor activation sensitivities can be affected, resulting in hyperalgesia (pain is perceived as more intense) and allodynia (nonpainful sensations, such as light touch, trigger pain).[8] Postherpetic pain, diabetic neuropathy, and complex regional pain syndrome are examples of neuropathic pain.[12]

ACUTE PAIN

Appropriate care of pain should be a primary goal of any medical treatment. But in light of the current theories regarding the role acute pain plays in the development of chronic pain, prompt, effective management of acute pain is essential.[11] Such care also can improve quality of life for patients, decrease work loss, and reduce overall costs, including health-care expenses and lost income.

Ankle Sprains

Most acute pain involves inflammation and results from injuries such as accidents, sprains, strains, surgery, or infection. One of the most common acute injuries is the sprained ankle, and injuries to the ankle account for 25% of all sports-related injuries.[13,14] Ankle sprains most commonly entail damage to lateral ankle ligaments and syndesmotic ligaments, with 85% of sprains involving the former.[13,14] The lateral ankle ligaments include the anterior talofibular ligament (ATFL), the calcaneofibular ligament (CFL), and the posterior talofibular ligament (PTFL).[13] The most commonly injured of these ligaments is the ATFL, followed by the CFL (***Figure 2***).[13]

A thorough physical examination is critical to a proper diagnosis. The physical examination of an ankle sprain should include an assessment of the overall appearance of the ankle to determine the degree of edema and ecchymosis and whether the patient can put any weight on the joint. Clinicians should carefully palpate the ligaments and tendons of the ankle with one finger.[13] It is also im-

portant to evaluate the neurologic response to determine if there is loss of sensation or motor weakness that might indicate peroneal nerve or tibial nerve injury that can occur with severe lateral ankle sprain.[13,15] Practitioners should test for ankle instability, including the anterior drawer and talar tilt, and grade the degree of sprain using the West Point Ankle Sprain Grading System (***Table 1***).

X-rays are necessary only if the injury fulfills the requirements of the Ottawa Ankle Rules—bone tenderness at the posterior edge or tip of the lateral malleolus or at the posterior edge or tip of the medial malleolus for an ankle x-ray, or bone tenderness at the base of the fifth metatarsal or the navicular bone for a foot x-ray. If the patient is unable to bear weight on the foot, an x-ray should be taken as well.[16]

With a grade 1 sprain, the patient can anticipate returning to sports and other active pursuits after about 11 days of rest, while those with a grade 2 sprain should wait 2 to 6 weeks. A grade 3 sprain will require that the patient abstain from sports or other strenuous activities for 4 to 26 weeks.[13] Standard treatment for sprains is RICE (**R**est, **I**ce, **C**ompression, and **E**levation). Clinicians should advise patients to limit initial swelling from hematoma and edema around the ankle by keeping off their foot, using ice packs, and wearing either an elastic bandage, felt doughnut, neoprene or elastic orthosis, or pneumatic device for compression.[13] They should elevate the limb as much as possible following the injury. However, early mobilization has been shown to be beneficial following injury, and weight bearing with an orthosis or other bracing is permissible as long as it is pain-free.[13]

Rehabilitation can help the patient to regain full pain-free range of motion with joint mobilization and stretching, isotonic and isokinetic exercises to increase strength, and proprioceptive training.[13] Following rehabilitation, emphasis should be on sport-specific exercises with the goal of returning the patient to participation in sports.[13] Among those engaged in athletic activities, there is a 2-fold risk for reinjury after a previous sprain, and in some patients, ankle sprain recurrence can result in disability and chronic pain or joint instability.[14] A Dutch study evaluating the use of extended proprioceptive training at home following usual care and rehabilitation is currently under investigation, with results expected in 2009.[14]

Acute Low Back Pain

In contrast to ankle sprain, which is fairly well understood and where the direct cause is often easily identified, acute low back pain is a more complex injury. Frequently seen in the primary-care setting, low back pain is common in all age groups, but particularly so among those under the age of 65 years. Among those aged 17 to 44 years, it is the sixth most common diagnosis seen in primary care, and in those aged 45 to 64 years it is the fifth most common.[17] Over the course of a lifetime, an estimated 70% to 80% of adults will experience acute low back pain.[18,19]

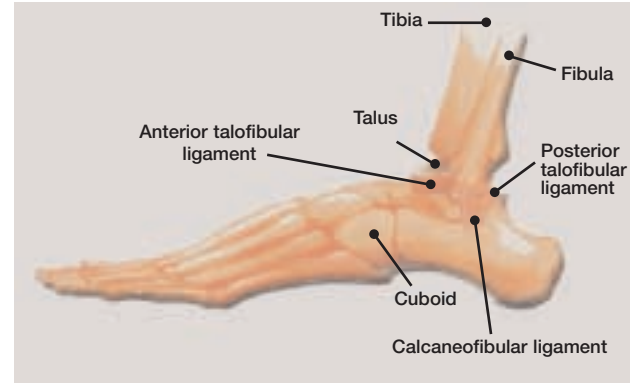

FIGURE 2. Ankle Sprains: Clinical Evaluation

Acute low back pain, defined as pain below vertebra T7, is usually activity related, and most occurrences resolve without treatment.[20,21] The sources of low back pain may be superficial somatic, deep somatic (muscle, joint, tendon, bursa, disk), neurogenic (mixed motor sensory nerves), visceral referred, or possibly psychogenic. The most common source of acute low back pain is the musculoligamentous structures.[21] Pain is usually localized to the lower back and buttocks, but may radiate to the lower leg if there is nerve root irritation or lumbar canal stenosis.[21] Nearly 60% of patients with acute low back pain do not seek medical attention, but choose to treat themselves with over-the-counter (OTC) analgesics, rest, and heat.[21,22] Most people with acute low back pain recover within 6 to 12 weeks.[21]

Spinal manipulation for low back pain has been used for centuries.[23] A meta-analysis of low back pain trials that compared manipulation with other treatments such as exercise, bed rest, analgesics, diathermy, and sham manipulation found that in patients with uncomplicated acute low back pain, spinal manipulation has some short-term benefit.[23] Recently, the American Pain Society and the American College of Physicians have published evidence-based clinical practice guidelines for the diagnosis and treatment of low back pain.[4]

The Importance of Maintaining Activity

One of the most effective modalities for patients is movement. From the standpoint of evolution, this makes a great deal of

TABLE 1. West Point Ankle Sprain Grading System

Criterion	Grade 1	Grade 2	Grade 3
Tenderness	ATFL	ATFL, CFL	ATFL, CFL, PTFL
Edema, ecchymosis	Slight local	Moderate local	Significant and diffuse
Weight-bearing ability	Full or partial	Difficult; may need crutches	Impossible w/o significant pain
Ligament damage	Stretched	Partial tear	Complete tear
Instability	None	None or slight	Definite

ATFL, anterior talofibular ligament; CFL, calcaneofibular ligament; PTFL, posterior talofibular ligament
Hockenbury RT, et al. *Physician Sports Med.* 2001;29:1-12.

sense. Thousands of years ago, most people had manual jobs, which put them at risk for back injury. However, it is unlikely they would be able to rest while eluding predators or hunting for food. This suggests that the body has evolved to function while recovering from injury.

Evidence appears to support the benefits of continued movement. A recent study in adolescents found that an exercise program was an effective short-term treatment strategy for nonspecific low back pain in this group.[24] Another study conducted in 282 patients with nonspecific low back pain found that prolonged bed rest in the early phase of pain resulted in higher long-term disability levels.[25]

A meta-analysis found that the evidence was more equivocal; those with nonspecific low back pain benefited from activity, but it had no effect in patients with sciatica when compared with 14 days of bed rest. However, the authors concluded that it was reasonable to advise patients with either acute low back pain or sciatica to remain active because activity caused no harm.[26]

In patients with acute low back pain, bed rest for more than 2 or 3 days is ineffective and may actually be harmful, so patients should be encouraged to stay active and avoid aggravating factors.[27] Recommendations include modifying activities such as prolonged sitting, standing, walking for the first 3 days or not lifting more than 5 lb for severe low back pain and 2 to 5 days for sciatica in patients whose normal workload is light and involves mostly sitting and carrying no more than 20 lb.[27] For those with a medium workload (equal amounts of standing, sitting, and walking; lifting up to 50 lb), no modification is necessary with mild back pain. With severe back pain, patients should limit their activities for up to 14 to 17 days, and in those with sciatica, for up to 21 days.[27]

In patients who normally engage in heavy work (constant standing or walking; lifting up to 100 lb), those with even mild low back pain should modify their activities for 7 to 10 days, and those with severe pain or sciatica, for 35 days. Patients in this category should not lift anything heavier than 25 lb more than 15 times per hour and should refrain from prolonged standing or walking without a 10-minute break every hour.[27]

Pharmacologic Management of Acute Low Back Pain

In many patients with acute low back pain, pharmacologic management is necessary. Managing acute pain involves making trade-offs between pain relief and side effects. An interesting study of patient preferences regarding treatment for acute pain showed that patients weighed the importance of side effects more heavily than pain relief. Route of administration received the lowest rating.[28] Among those side effects patients want to avoid include vomiting, nightmares or hallucinations, and nausea. The side-effect profile is thus a significant factor for patients and a key consideration for clinicians treating acute pain.[28]

Acetaminophen is a first-line OTC analgesic and antipyretic agent.[29] It is safe for adults in doses of up to 4 g per day[29] and can be effective in mild to moderate pain.[30] It has few side effects, but unfortunately only weak anti-inflammatory properties.[29,31] Its mechanism of action is controversial, but it appears to operate centrally, possibly through cyclooxygenase (COX) enzyme inhibition in the central nervous system.[29,31]

The biggest drawback to acetaminophen is liver and kidney toxicity. Single doses of >100 mg/kg may result in severe liver damage, hypoglycemia, and acute tubular necrosis.[29] In the setting of acute low back pain it can be an effective analgesic, is a valuable alternative when nonsteroidal anti-inflammatory drugs (NSAIDs) are contraindicated, and in mild to moderate pain has shown comparable efficacy to NSAIDs.[29-31]

Opioid analgesia is often used for severe pain. The World Health Organization (WHO) pain ladder states that as a first step, acetaminophen, aspirin, or another NSAID should be used for mild to moderate pain.[32] However, when pain persists or increases, clinicians should consider adding an opioid such as codeine or hydrocodone to the NSAID or acetaminophen, often available in fixed-dose combinations. If the pain is initially persistent or moderate to severe, higher doses of opioids may be necessary, and fixed-dose combinations may not be effective because toxicity limits the dose of acetaminophen or NSAID.[32]

Oral opioids are effective for both localized and generalized pain, and the ceiling to the analgesic effectiveness is limited only by its side effects. Long-acting controlled-release formulations are

available, and this class has sedative and anxiolytic properties that can be beneficial in the acute setting in some patients. However, adverse effects such as sedation, constipation, respiratory depression, and addiction potential often limit long-term use of these opioids. Concerns about abuse and addiction[32,33] and fears of regulatory oversight have often deterred clinicians from using this class of drug.[33]

The use of muscle relaxants has come under scrutiny: Do these agents relax the muscles and promote healing or simply sedate patients? Furthermore, muscle spasm is a normal protective response to injury. It is possible that spasm blockade may encourage the patient to indulge in excessive activity prematurely, potentially leading to further injury.[34]

This is not to say that muscle spasm is not a problem in acute low back pain. There is a spasm-pain-spasm cycle that develops out of emotional tension, inflammation, and fear of pain that can lead to restricted movement and circulatory stasis, with buildup of metabolites, which in turn leads to increased pain and muscle spasm (***Figure 3***).[35]

Interrupting this cycle to improve circulation and mobility and decrease pain and spasm is an important goal. Small doses of muscle relaxants may be beneficial in this situation. Cyclobenzaprine hydrochloride was studied in 2 placebo-controlled trials in acute skeletal muscle spasm. Doses of 2.5 mg, 5 mg, and 10 mg TID were compared with placebo in 1,405 patients with acute musculoskeletal spasm—two thirds with low back pain.[36] Onset of relief occurred within 24 to 48 hours with the 5-mg dose and within 24 hours with the 10-mg dose. Although the 2.5-mg TID dose of cyclobenzaprine was not significantly more effective than placebo until day 3 of the study, both the 5- and 10-mg doses were significantly more effective than placebo. Moreover, the 5-mg dose was as effective as the 10-mg dose, but with less sedation (***Figure 4***).[36]

NSAIDs: The Current Landscape

Because most pain begins with inflammation,[37] the NSAIDs are a logical choice for acute pain. The nonselective NSAIDs inhibit both COX-1 and COX-2 isoenzymes, while the COX-2 selective inhibitors target the COX-2 isoenzymes. NSAIDs are effective nonspecific analgesics and anti-inflammatories, which can be used in addition to acetaminophen or opioids. Though they are nonsedating and not addictive, their side-effect profiles warrant concern. COX-1 is constitutive and plays an important role in body homeostasis in the stomach, intestines, and kidney and in platelets, while COX-2 is

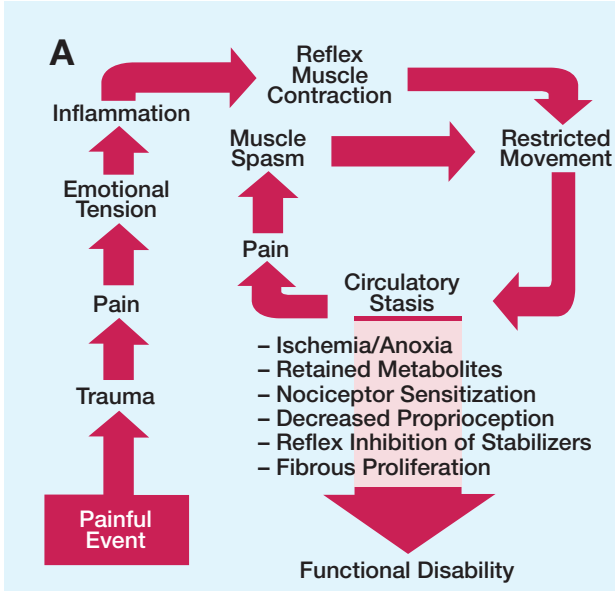

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FIGURE 3. Spasm-Pain-Spasm Cycle

inducible.[38,39] Both work at the inflammatory site and are active in macrophages, synoviocytes, and endothelial cells.[38-40]

Most of the anti-inflammatory characteristics of the NSAIDs are the result of COX-2 inhibition.[38] However, data indicate that 16% of those using NSAIDs experience dyspepsia at least twice a day.[41] More serious side effects, such as ulcers and bleeding, occur in a smaller percentage of patients, but result in a hospitalization rate of 2.2% among regular users of NSAIDs.[42] Each year 16,000 individuals die as the result of gastrointestinal adverse events associated with NSAIDs.[43]

In recent years, the news regarding NSAIDs and COX-2 inhibitors has been unfavorable. In 2004, the FDA issued a black box warning for the NSAIDs, and Merck withdrew the COX-2 inhibitor rofecoxib from the market. In 2005, the FDA gave celecoxib a black box warning, and Pfizer withdrew valdecoxib from the market. The FDA did not approve etoricoxib in 2007.[44] In addition, the safety of acetaminophen for cardiovascular and hepatic effects has been questioned.[45,46]

Despite these misgivings about the NSAID class of drugs, they are frequently used in primary care to treat acute low back pain.[47] NSAIDs are used either alone or in combination with a muscle relaxant in 59% of low back pain cases.[47] Another 4% are treated with an NSAID-opioid combination, and 3% use all 3 classes of drug.[47] Only about 14% of patients who receive some type of pain therapy do not use an NSAID (***Figure 5***).[47]

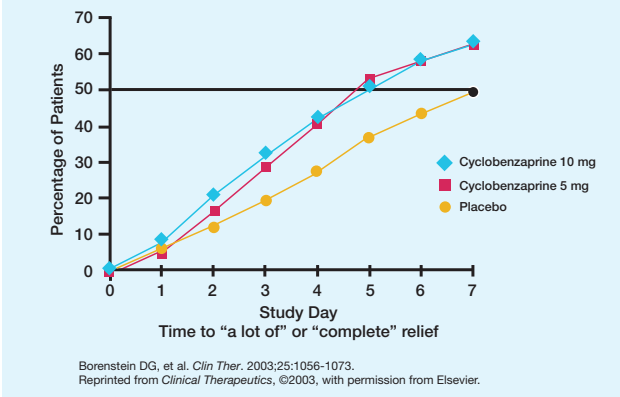


FIGURE 4. Time to Relief for Acute Skeletal Muscle Spasm

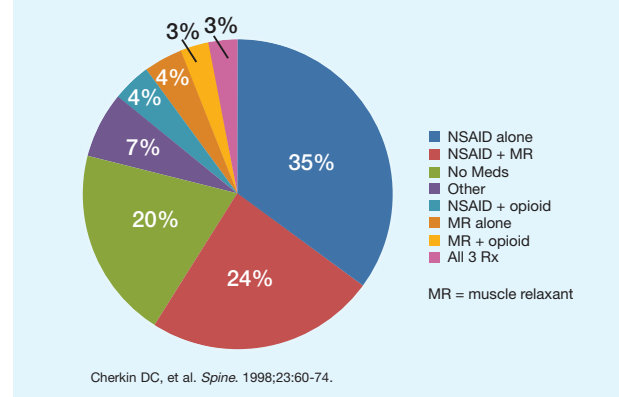


FIGURE 5. Medications in Primary Care: Acute Low Back Pain

Topical NSAIDs

New to the treatment options in managing acute pain are commercially available topical NSAIDs, which have enjoyed popularity in Europe, Japan, and South Africa, but are used less often in the US. Applied directly to the site of the pain, the topicals enhance local drug delivery with an efficacy similar to that of oral formulations but minimize systemic effects and reduce serious adverse events.[48] In comparative trials, pain scores decreased from 70% to 39% in patients treated with topicals, and the percentage of patients who improved from baseline ranged from 26% to 80%.[48]

There is also less opportunity for drug-drug interactions. Because they avoid the gastrointestinal tract and first-pass metabolism, topicals cause less nausea, vomiting, and dyspepsia than oral NSAIDs.[48] While adverse events occur in approximately 10% of patients treated with topical NSAIDs, most events are localized pruritus or rashes at the site of administration, which quickly resolve once the treatment is discontinued. Gastrointestinal events are rare with topicals.[48]

In the US, however, there has been a fair amount of skepticism regarding topical agents. Many have failed in US trials over the past decade, and the mechanism of action is not fully understood. Some question whether a sufficient amount penetrates the skin.[48] This skepticism may be reinforced by the high placebo response that occurs with pain, partly as the result of the natural progression of healing in acute complaints. But topical NSAIDs have been available in Europe and Asia for more than 20 years,[48] both as prescriptions and OTC. They are available in a variety of dosage forms: gels, creams, ointments, patches, and sprays, and several NSAIDs are used in this manner, including diclofenac, ibuprofen, indomethacin, ketoprofen, naproxen, and piroxicam.[48]

Two topical NSAIDs have now received approval in the US: the diclofenac epolamine patch (Flector® patch) and diclofenac sodium gel (Voltaren® gel).[49,50] The patch has been approved for acute pain due to minor sprains, strains, and contusions and is used BID. The gel is indicated for osteoarthritis of the joints and is used QID. Both agents carry the NSAID class black box warning for serious cardiovascular and gastrointestinal adverse effects.

Pharmacokinetics of Topical NSAIDs

Peak plasma levels with topical NSAIDs are less than 10% of the concentrations achieved with oral administration (range 0.2% to 8.0%).[48,51] Time until C_{max} is 2.2 to 23 hours, which is 10 times longer than the time to achieve C_{max} with an oral dose.[48] Steady state is achieved within 2 to 5 days of repeated application.[48,51] Relatively high concentrations are achieved in the dermis, while the level in the muscle is at least equivalent to that obtained following an oral dose.

Furthermore, topical NSAIDs can concentrate in the intra-articular tissues[48]; NSAID concentrations in meniscus and cartilage have been found to be 4.1- to 6.8-fold higher than those achieved after oral administration.[48] Given these characteristics, it is possible that topical NSAIDs may represent a safer alternative to the oral agents.

CHRONIC PAIN: CURRENT AND FUTURE OPTIONS

Chronic pain affects approximately one-third of the population at some point in their lives.[2] Forty-two percent of those with chronic pain have had it for more than a year, and far too many pain sufferers do not receive adequate control.[1] It is often undertreated or not treated at all. Chronic low back pain is one of the most frequent of chronic pain syndromes. An estimated 26 million Americans suffer from frequent or chronic back pain.[1] Although most episodes of low back pain resolve within 12 weeks,

approximately 10% of patients will develop chronic low back pain.[21] The societal cost is significant, with the total spending to treat this problem ranging from $20 to $50 billion annually.[21] Low back pain is a significant cause of lost wages and poor functioning at work and is the leading cause of physical disability.[21]

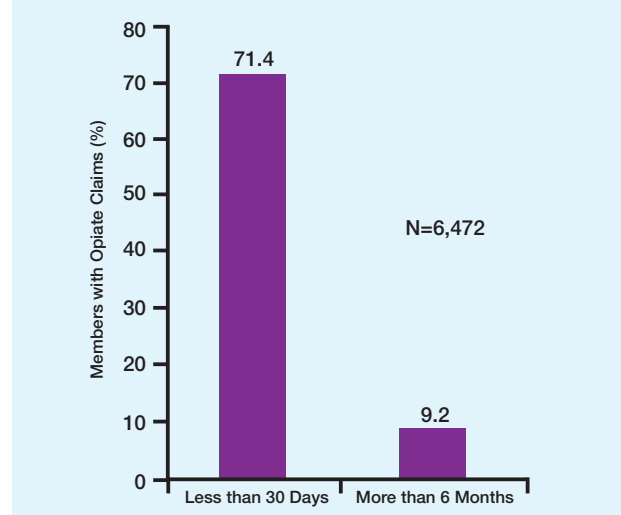
Chronic pain treatment goals differ from those of acute pain. Acute pain management goals focus on pain reduction or elimination with a greater tolerance to short-term decreased functioning and side effects. When managing chronic pain, maximizing long-term functioning and minimizing side effects become much more critical. To achieve these goals, clinicians treat chronic pain on a continuum.[52]

Treatment often begins with less invasive modalities, which, if needed, progress to more aggressive therapies. Chronic opioid therapy (COT) is the cornerstone of management for malignant pain, and its use in chronic nonmalignant pain management is increasing.[53] However, in select patients, transcutaneous electrical nerve stimulation (TENS), interventional techniques, spinal cord stimulation, spinal infusion pumps, and surgical treatment may be appropriate.[54] Rational polypharmacy is a concept that suggests using multiple drugs that act via different mechanisms in combination to keep the average doses of each individual drug reduced, with the goal to have greater benefits with fewer adverse effects.[55]

When using COT as part of the pain management treatment plan, the prescriber must recognize that patients start with opioids in the acute pain setting. In 2001, a large health insurance company covering 255,958 lives found that 7% of the claims were for low back pain.[21] A total of 6,472 members received an opioid. Although most of the members (71.4%) did not use an opioid for more than 30 days, nearly 1 in 10 members remained on opioids for more than 6 months (***Figure 6***).[21] Clinicians need to be aware of the multiple factors that may contribute to the long-term use of opioids, such as pain severity and comorbid conditions, and to manage the patient's expectations regarding a long-term treatment plan.

Undertreatment of Pain

Many pain sufferers tragically do not receive adequate control of their pain with currently available methods. Both clinicians and patients share responsibility in this problem. Multiple barriers to pain control have been identified. Among these are inadequate clinician knowledge and skills, fear of regulatory scrutiny and potential liability, and inadequate accountability for providing appropriate pain relief.[56] Often pain relief is simply not made a priority in patient care. Furthermore, patients themselves may contribute to inadequate treatment as fears about addiction and adverse effects keep them from seeking and using appropriate therapy.[56]



Adapted from Vogt MT, et al. *Spine*. 2005;30:1075-1081.

FIGURE 6. Duration of Opioid Use in Back Pain

The Changing Landscape of Drug Abuse

Surprisingly, in individuals aged 12 years or older initiating drug use, the most common illicit drug is no longer marijuana; it is nonmedical use of prescription pain relievers. In 2006, 2.2 million adolescents and adults tried prescription pain relievers for nonmedical use, while 2.1 million tried marijuana.[57] Overall, 5.2 million were current, nonmedical users of prescription pain relievers.[57] In 2006, 22.6 million people had a substance dependence or abuse disorder, or 9.2% of the population over the age of 12; 1.6 million of these were dependent on or abused pain relievers.[57] Prescription drug abuse is ranked third, behind tobacco and alcohol.[57]

Many of those using prescription pain relievers for nonmedical reasons are adolescents and young adults.[57] The source for much of this misuse may come as a surprise, however. Survey data show that 55.7% of these users were able to get their drugs from a friend or relative for free, while 19.1% received them from a single health-care practitioner. Only 3.9% obtained their drugs from a dealer or stranger and 0.1% from the Internet.[57]

Given the number of adolescents and young adults who obtain their illicit drugs from the medicine cabinets of their friends and relatives, it is important to warn patients who take prescription pain relievers to safely store their medications. Patients also

TABLE 2. Opioid Risk Tool

	Male	Female
Family History of Substance Abuse		
Alcohol	3	1
Illegal drugs	3	2
Prescription drugs	4	4
Personal History of Substance Abuse		
Alcohol	3	3
Illegal drugs	4	4
Prescription drugs	5	5
Age (if between 16 and 45 years)	1	1
History of Preadolescent Sexual Abuse	0	3
Psychological Disease		
ADD, OCD, bipolar disorder, schizophrenia	2	2
Depression	1	1
Low (0-3); Moderate (4-7); High (8+) Total	(26)	(26)

ADD, attention-deficit disorder; OCD, obsessive-compulsive disorder.
Webster LR, et al. *Pain Med.* 2005;6:432-442.

should be warned to carefully dispose of all unused or expired pain medications—usually in the garbage and mixed with undesirable materials such as cat litter or coffee grounds and secured in a nondescript container.[58]

Defining Addiction, Dependence, Tolerance, and Pseudoaddiction

To properly treat patients with opioids, it is important to understand the differences among terms such as addiction, dependence, tolerance, and pseudoaddiction. While these terms are often confused, even in the medical community, they have distinct definitions and cannot be used interchangeably.

Addiction is a primary, chronic, neurobiologic disease with genetic, psychosocial, and environmental factors that influence its development and expression. Characteristics include impaired control over drug use, compulsive use, continued use despite harm, and craving.[59]

Physical dependence is a state of adaptation to a drug that is marked by a drug class-specific **withdrawal syndrome** that may occur with sudden cessation of the drug, rapid dose reduction, decreasing serum drug levels, or administration of an antagonist.[59]

Tolerance is an adaptation of the body to the drug in which exposure induces changes that result in diminishment of one or more of the drug's effects over time.[59] Patients develop tolerance to both desired effects and undesired effects of drugs. With opioids, tolerance usually develops more quickly to respiratory depression than to analgesia, but tolerance may never develop to the constipating effects of this drug class. Tolerance to the analgesic effects is variable, and no upper limit has been established.[59]

Pseudoaddiction describes behavior that in many ways mimics behaviors of addiction but is motivated by undertreated pain. Patients with unrelieved pain may focus on obtaining medication; they may "clock watch," and seem to be "drug seeking." They may hoard medication or try to obtain early refills. Pseudoaddiction can be distinguished from addiction in that the behaviors will cease when pain is effectively treated.[59]

Opioid Prescribing Guidelines

A number of steps can be taken to ensure effective care and reduce the risk for misuse and abuse when prescribing opioids for patients. It is essential to thoroughly evaluate a patient, including a pain history and assessment of the impact of pain on the patient, a directed physical examination, review of previous diagnostic studies and interventions, drug history, and assessment of coexisting diseases or conditions.[60] Clinicians should develop a treatment plan with goals and provide informed consent to their patients. A periodic review of the plan and how goals are being met is essential, as is keeping meticulous medical records. When in doubt, obtain a consultation with a pain specialist or psychologist. Patients with a history of addiction or a comorbid psychiatric disorder will require special consideration but may be treated with opioids if necessary. Finally, clinicians must comply with controlled-substance laws and regulations.[60]

Risk assessment is an important part of managing chronic pain with opioids. Common instruments of risk assessment include ORT (Opioid Risk Tool) and SOAPP (Screener and Opioid Assessment for Patients in Pain) (***Table 2***). COT agreements may be made with patients and signed. Urine toxicology testing may be useful. In states where they are available, prescription monitoring programs can help determine if a patient is receiving controlled substances from another clinician.

The 4 A's—**A**ctivities of daily living, **A**nalgesia, **A**dverse effects, and **A**berrant behaviors—should be assessed at every visit to ensure the patient's pain is being appropriately treated with minimal side effects and good daily functioning, and that there are no signs of abuse or misuse.[61] Many patients may exhibit aberrant behaviors during COT. Aberrant behavior may be a sign of abuse, but when evaluating this behavior, other factors

TABLE 3. The 4 C's

4 C's for Less Predictive Aberrant Behavior
Counsel in person on appropriate medication use
Cut down quantity of medication provided
Collect a urine sample for toxicology testing
Contact state prescription monitoring program for a profile

Adler JA, et al. AAPA Annual Conference; May 27, 2008; San Antonio, TX.

should be considered. A differential diagnosis in addition to abuse and addiction includes undertreatment of pain, misuse, random occurrence, or diversion.

Aberrant behaviors that are more predictive of drug abuse and diversion include selling prescription drugs, prescription forgery, stealing or borrowing another patient's drugs, injecting an oral formulation, obtaining prescription drugs from nonmedical sources, concurrent abuse of related illicit drugs, multiple unsanctioned dose escalations, and recurrent prescription losses.[62] Behaviors that are less predictive of drug abuse include aggressive complaining about the need for higher doses, drug hoarding during periods of reduced symptoms, requesting specific drugs, acquiring similar drugs from other medical sources, unsanctioned dose escalation 1 to 2 times, unapproved use of the drug to treat another symptom, and reporting psychological effects not intended by the clinician.[62]

Patients are generally not compliant with medical treatment plans, including those that involve opioids. Many patients do not complete 1-week antibiotic prescriptions exactly as prescribed, and treatments for chronic diseases such as diabetes and asthma are bound to periods of noncompliance. When evaluating patients' compliance, consider their adherence to nonopioid therapies in their treatment plan, such as adjuvant medications, physical therapy, imaging and lab requests, consultations, and procedures. Typically, patients who display concerning noncompliance are often noncompliant in multiple areas of their treatment plan.

In dealing with first-time, less predictive aberrant behaviors, using the 4 C's may be helpful. The patient should be **C**ounseled in person on appropriate medication use. The quantity of prescribed medication should be **C**ut down. A urine sample should be **C**ollected for toxicology testing, and the state prescription monitoring program (PMP) should be **C**ontacted for a profile (***Table 3***).[63]

Disparities in Pain Therapy

A number of groups within the general population are at greater risk for receiving inadequate pain therapy. In some cases this may reflect preconceptions about risk for potential abuse.

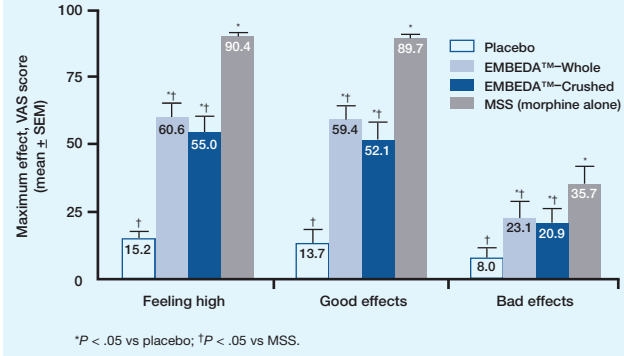
Evidence suggests that African Americans may be less likely to receive opioids for chronic nonmalignant pain. While African Americans are equally likely to receive the same treatment in nonopioid-related therapies as their Caucasian American counterparts, they are significantly less likely to be treated with opioids. When compared with African Americans, Caucasians receiving opioids have an odds ratio of 2.67 in an analysis of survey data from 397 patients with chronic nonmalignant pain.[64]

Osteoarthritis studies show that African Americans who do receive opioids are more likely to receive lower mean annual supplies. African Americans receive daily opioid doses that are on average below the recommended daily doses for treatment of this disease.[65] Furthermore, both Hispanics and African Americans are more likely to have poorer outcomes for pain and disability with osteoarthritis than are Caucasian Americans.[66]

A recent study of primary care physicians' perceptions of patients' pain may shed some light on this problem. Physicians were found to underestimate pain intensity relative to their patients 39% of the time in this survey of 463 patients and their physicians. Forty-six percent agreed with their patients' assessment of pain, and 15% overestimated their patients' pain levels by 2 or more points.[67] Physicians were more likely to underestimate the pain of African American patients (47.0%) than that of Caucasians (33.5%) (odds ratio, 1.92; 95% confidence interval, 1.3-2.8; $P < .005$).[67]

Future Directions

Research is ongoing to improve pain management, reduce the risk of opioid abuse, and minimize diversion. Among the new



VAS, visual analog scale.
From Jones JB, et al. Presented at the 24th Annual Meeting of the American Academy of Pain Medicine; February 2008; Orlando, FL.

FIGURE 7. Opioid Abuse Deterrents: VAS Ratings of Drug Effects

technologies are embedded antagonists combined with the opioid. If there is any attempt to alter the medication, the desired opioid effect of the medication is diminished. Embedded irritant technology uses substances, such as capsaicin, that are released if the medication is altered. Work is also being done on tablet technology to create greater tamper resistance.

An example of embedded irritants—sustained-release morphine plus a deterrent—has been compared with both placebo and immediate-release morphine alone, as well as the deterrent agent crushed (***Figure 7***).[68] It is thought that crushing a currently available sustained-release morphine tablet can result in comparable effects to immediate-release morphine.

When taken whole, the oral morphine plus the embedded deterrent (EMBEDA™) reduced the "highs" experienced as compared with morphine alone. When crushed, the embedded deterrent reduced the highs even further. The bad effects were also lower with the embedded formulation, both whole and crushed.

CONCLUSIONS

Acute and chronic pain are common problems encountered in primary care that are often ignored or undertreated. Effective treatment of acute pain may prevent some chronic pain, and effective treatment of both types of pain can improve quality of life and productivity of patients, and may be less costly in the long run. Clinicians should treat patients with acute pain early to avoid later dysfunction. Muscle relaxants may play a role in low back pain, and with most acute pain, patients should ambulate as early as possible. Newer options include topical NSAIDs, which offer an effective alternative for acute pain resulting from injuries such as ankle sprains or low back pain, and may reduce the incidence of side effects associated with oral NSAID formulations while delivering effective pain relief to patients.

Opioids may be necessary to treat chronic pain in many patients. The increase in the legitimate use of opioids has coincided with an increase in opioid misuse, abuse, and diversion. New medication technologies are on the horizon to address the undertreatment of pain, diversion, and the abuse of prescription drugs. The addition of antagonists, irritants, and other technologies will hopefully reduce the desirability for nonmedical uses while reducing various barriers to those in pain to receive appropriate treatment. The search for cures to relieve pain and suffering is ongoing, but for many, the management of pain must be a priority to provide the greatest gains in overall quality of life.

REFERENCES

1. American Pain Foundation. Pain Facts & Figures. Available at: www.painfoundation.org/page.asp?file=Newsroom/PainFacts.htm. Accessed June 20, 2008.
2. Brookoff D. Chronic pain: I. A new disease? *Hosp Pract*. 2000;35:45-52.
3. National Institutes of Health. NIH guide: new directions in pain research, I. Available at: http://grants.nih.gov/grants/guide/pa-files/PA-98-102.html. Accessed June 20, 2008.
4. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med*. 2007;147:478-491.
5. National Pain Foundation. Harris Interactive Survey. December 2007.
6. Meisler JG. Toward optimal health: the experts discuss chronic pain. *J Womens Health Gend Based Med*. 2002;11:341-345.
7. Campbell JN, Meyer RA. Mechanisms of neuropathic pain. *Neuron*. 2006;52:77-92.
8. Fields HL, Martin JB. Pain. In: Fauci AS, Braunwald E, Isselbacher KJ, et al, eds. *Harrison's Principles of Internal Medicine*. 14th ed. New York, NY: McGraw-Hill;1998:53-58.
9. Fine PG, Portenoy RK. *A Clinical Guide to Opioid Analgesia*. New York, NY: McGraw-Hill, Healthcare Information Programs; 2004.
10. Pommering TL, Kluchurosky L, Hall SL. Ankle and foot injuries in pediatric and adult athletes. *Prim Care*. 2005;32:133-161.
11. Reuben SS, Ekman EF, Raghunathan K, et al. The effect of cyclooxygenase-2 inhibition on acute and chronic donor-site pain after spinal-fusion surgery. *Reg Anesth Pain Med*. 2006;31:6-13.
12. Galluzzi KE. Managing neuropathic pain. *J Am Osteopath Assoc*. 2007;107(suppl 6):ES39-ES48.
13. Hockenbury RT, Sammarco GJ. Evaluation and treatment of ankle sprains. *Physician Sports Med*. 2001;29:1-12.
14. Hupperets MD, Verhagen EA, van Mechelen W. The 2BFit study: is an unsupervised proprioceptive balance board training programme, given in addition to usual care, effective in preventing ankle sprain recurrences? Design of randomized controlled trial. *BMC Musculoskelet Disord*. 2008;9:71-80.
15. Nitz AJ, Dobner JJ, Kersey D. Nerve injury and grades II and III ankle sprains. *Am J Sports Med*. 1985;13:177-182.
16. Stiell I. Ottawa ankle rules. *Can Fam Phys*. 1996;42:478-480.
17. Blount BW, Hart G, Ehreth JL. A description of the content of army family practice. *J Am Board Fam Pract*. 1993;6:143-152.
18. Cai C, Pua Y-H, Lim KC. Correlates of self-reported disability in patients with low back pain: the role of fear-avoidance beliefs. *Ann Acad Med Singapore*. 2007;36:1013-1020.
19. Biering-Sørensen F. A prospective study of low back pain in a general population. 1. Occurrence, recurrence, and aetiology. *Scand J Rehab Med*. 1983;15:71-79.
20. Grunnesjö M, Bogefeldt J, Blomberg S, et al. The course of pain drawings during a 10-week treatment period in patients with acute and subacute low back pain. *BMC Musculoskelet Disord*. 2006;7:65-73.
21. Vogt MT, Kwoh CK, Cope KD, et al. Analgesic usage for low back pain: impact on health care costs and service use. *Spine*. 2005;30:1075-1081.
22. Carey TS, Evans AT, Hadler NM, et al. Acute severe low back pain. A population-based study of prevalence and care-seeking. *Spine*. 1996; 21:339-344.
23. Shekelle PG, Adams AH, Chassin MR, et al. Spinal manipulation for low-back pain. *Ann Intern Med*. 1992;117:590-598.
24. Jones MA, Stratton G, Reilly T, et al. Recurrent non-specific low-back

pain in adolescents: the role of exercise. *Ergonomics*. 2007;50:1680-1688.
25. Verbunt JA, Sieben J, Vlaeyen JW, et al. A new episode of low back pain: who relies on bed rest? *Eur J Pain*. 2008;12:508-516.
26. Hilde G, Hagen KB, Jamtvedt G, et al. Withdrawn: advice to stay active as a single treatment for low-back pain and sciatica. *Cochrane Database Syst Rev*. 2006;CD003632.
27. Kinkade S. Evaluation and treatment of acute low back pain. *Am Fam Physician*. 2007;75:1181-1188.
28. Gan T, Lubarsky D, Flood E, et al. Patient preferences for acute pain treatment. *J Pain*. 2003;4(suppl 1):60. Abstract 836.
29. Power I, Barratt S. Analgesic agents for the postoperative period. *Surg Clin North Am*. 1999;79:275-295.
30. American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee. *Arthritis Rheum*. 2000;43:1905-1915.
31. Lipetz JS, Malanga GA. Oral medications in the treatment of acute low back pain. *Occup Med*. 1998;13:151-166.
32. Jacox A, Carr DB, Payne R, et al. Management of cancer pain. Clinical Practice Guideline No. 9. US Department of Health and Human Services: 1994; AHCPR Publication No. 94-0592.
33. Moreland LW, St. Clair EW. The use of analgesics in the management of pain in rheumatic diseases. *Rheum Dis Clin North Am*. 1999;25:153-159.
34. Littrell RA, Hayes LR, Stillner V. Carisoprodol (Soma): a new and cautious perspective on an old agent. *South Med J.* 1993;86:753-756.
35. Chek P. The healing power of the pool. Available at: www.paulchek-seminars.com/articles.cfm?select=36. Accessed June 2, 2008.
36. Borenstein DG, Korn S. Efficacy of a low-dose regimen of cyclobenzaprine hydrochloride in acute skeletal muscle spasm: results of two placebo-controlled trials. *Clin Ther*. 2003;25:1056-1073.
37. Stiell I, Wells G, Laupacis A, et al. Multicentre trial to introduce the Ottawa ankle rules for use of radiography in ankle injuries. *BMJ*. 1995;311:594-597.
38. Needleman P, Isakson PC. The discovery and function of COX-2. *J Rheumatol*. 1997;24(suppl 49):6-8.
39. Simon LS. Nonsteroidal antiinflammatory drugs and their effects. The importance of COX "selectivity." *J Clin Rheumatol*. 1996;2:135-140.
40. Chandrasekharan NV, Dai H, Roos LT, et al. COX-3, a cyclooxygenase-1 variant inhibited by acetaminophen and other analgesic/antipyretic drugs: cloning, structure, and expression. *Proc Natl Acad Sci U S A*. 2002;99:13926-13931.
41. Larkai EN, Smith JL, Lidsky MD, et al. Dyspepsia in NSAID users: the size of the problem. *J Clin Gastroenterol*. 1989;11:158-162.
42. Singh G, Triadafilopoulos G. Epidemiology of NSAID induced gastrointestinal complications. *J Rheumatol*. 1999;26(suppl 56):18-24.
43. Setter SM, Corbett CF, Sclar DA, et al. Nonsteroidal anti-inflammatory drugs (NSAIDs): research to help your patients use them safely. *Home Health Care Manag Pract*. 2001;13:468-475.
44. Food and Drug Administration. Approved new molecular entities (NMEs) received January 1, 1993 – December 31, 2004 and approved through 2005. Available at: www.fda.gov/oc/pdufa/FDADrugAppSafetyData_files/ NMESafetyData.html. Accessed June 3, 2008.
45. Watkins PB, Kaplowitz N, Slattery JT, et al. Aminotransferase elevations in healthy adults receiving 4 grams of acetaminophen daily: a randomized controlled trial. *JAMA*. 2006;296:87-93.
46. Hinz B, Cheremina O, Brune K. Acetaminophen is a selective cyclooxygenase-2 inhibitor in man. *FASEB J*. 2008;22:383-390.
47. Cherkin DC, Wheeler KJ, Barlow W, et al. Medication use for low back pain in primary care. *Spine*. 1998;23:607-614.
48. Heyneman CA, Lawless-Liday C, Wall GC. Oral versus topical NSAIDs in rheumatic diseases: a comparison. *Drugs*. 2000;60:555-574.
49. Flector (diclofenac epolamine topical patch) [prescribing information]. Piscataway, NJ: Alpharma Pharmaceuticals, LLC; 2007.
50. Voltaren (diclofenac sodium topical gel) [prescribing information]. Parsippany, NJ: Novartis Consumer Health, Inc.; 2007.
51. Stanos SP. Topical agents for the management of musculoskeletal pain. *J Pain Symptom Manage*. 2007;33:342-355.
52. Krames E. Pain medicine—using the tools of the trade. Available at: http://www.nationalpainfoundation.org/MyTreatment support_krames_0403.asp. Accessed August 4, 2008.
53. Passik SD, Kirsch KL, Whitcomb L, et al. A new tool to assess and document pain outcomes in chronic pain patients receiving opioid therapy. *Clin Ther*. 2004;26:552-561.
54. National Pain Foundation. Available at: http://www.nationalpainfoundation.org. Accessed August 4, 2008.
55. Kingsbury SJ, Yi D, Simpson GM. Psychopharmacology: rational and irrational polypharmacy. *Psychiatr Serv*. 2001;52:1033-1036.
56. Lipman AG. Pain Management for Primary Care Clinicians. Bethesda, MD: American Society of Health-System Pharmacists. 2004:283-287.
57. Substance Abuse and Mental Health Services Administration. Results from the 2006 National Survey on Drug Use and Health: National Findings; 2007.
58. Office of National Drug Control Policy. Proper disposal of prescription drugs. Available at: www.whitehousedrugpolicy.gov/drugfact/factsht/proper_disposal.html. Accessed July 1, 2008.
59. American Pain Society. Definitions related to the use of opioids for the treatment of pain. Available at: www.ampainsoc.org/advocacy/opioids2.htm. Accessed June 23, 2008.
60. American Pain Society. The use of opioids for the treatment of chronic pain. Available at: www.ampainsoc.org/advocacy/opioids.htm. Accessed May 8, 2008.
61. Passik SD, Weinreb HJ. Managing chronic nonmalignant pain: overcoming obstacles to the use of opioids. *Adv Ther*. 2000;1:70-81.
62. Passik SD, Portenoy RK, Ricketts PL. Substance abuse issues in cancer patients. Part 1: Prevalence and diagnosis. *Oncology*. 1998; 12:517-524.
63. Adler JA, Davis M. Chronic pain: current and future options. Presented at: American Academy of Physician Assistants 36th Annual Conference; May 27, 2008; San Antonio, TX.
64. Chen I, Kurz J, Pasanen M, et al. Racial differences in opioid use for chronic nonmalignant pain. *J Gen Intern Med*. 2005;20:593-598.
65. Dominick KL, Bosworth HB, Dudley TK, et al. Patterns of opioid analgesic prescription among patients with osteoarthritis. *J Pain Palliat Care Pharmacother*. 2004;18:31-46.
66. Dominick KL, Baker TA. Racial and ethnic differences in osteoarthritis: prevalence, outcomes, and medical care. *Ethn Dis*. 2004;14:558-566.
67. Staton LJ, Panda M, Chen I, et al. When race matters: disagreement in pain perception between patients and their physicians in primary care. *J Natl Med Assoc*. 2007;99:532-538.
68. Jones JB, Sokolowska M, Setnick B, et al. Pharmacodynamic (drug liking) effects of ALO-01, an investigational extended-release opioid formulation containing morphine sulfate and sequestered naltrexone, whole vs crushed. Presented at the 24th Annual Meeting of the American Academy of Pain Medicine; February 2008; Orlando, FL.

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1. A common form of neuropathic pain can result from a
a. Surgical procedure
b. Herpes zoster infection
c. First-degree burn
d. Fracture

2. Injuries to which area account for 25% of all sports-related injuries?
a. Ankle
b. Shoulder
c. Knee
d. Hip

3. Acute low back pain often radiates to the lower leg if there is
a. Ankylosing spondylitis
b. Ligament strain
c. Osteoarthritis
d. Lumbar canal stenosis

4. Individuals with sciatic pain should limit their activities for up to
a. 7 days
b. 14 days
c. 21 days
d. 28 days

5. Single doses of >100 mg/kg of acetaminophen may result in
a. Generalized seizures
b. Congestive heart failure
c. Paralytic ileus
d. Acute tubular necrosis

6. In a study of acute skeletal muscle spasm, 5-mg and 10-mg doses of which drug were more effective than placebo?
a. Tramadol
b. Hydrocodone
c. Cyclobenzaprine hydrochloride
d. Amitriptyline

7. The most common side effect in patients treated with topical NSAIDs is
a. Pruritus
b. Dyspepsia
c. Sedation
d. Constipation

8. Diclofenac sodium gel is indicated for
a. Acute gout
b. Osteoarthritis
c. Rheumatoid arthritis
d. Ankylosing spondylitis

9. Survey data show that more than 55% of those using prescription pain relievers for nonmedical reasons get their drugs from
a. Internet
b. Dealer or stranger
c. Single health-care practitioner
d. Friend or relative

10. Adaptation of the body to the drug in which exposure induces changes that result in the diminishment of the drug's effect over time is
a. Addiction
b. Pseudoaddiction
c. Tolerance
d. Physical dependence

11. In the Opioid Risk Tool, which factor is associated with increased risk for females but not males?
a. History of preadolescent sexual abuse
b. Family history of alcohol abuse
c. Personal history of illegal drug use
d. Psychological disease

12. Which behavior is more predictive of drug abuse and diversion?
a. Complaining about the need for higher doses
b. Experiencing recurrent prescription losses
c. Requesting specific drugs
d. Acquiring similar drugs from other medical sources

Developed in conjunction with AAPA

ALPHARMA Pharmaceuticals

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