Controlling Chronic Pain in the Workplace

Nerve Stimulation and Intrathecal Drug Delivery Systems

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ABSTRACT

Chronic pain can have a major effect on both workers and the workplace. Collaboration among workers, occupational health nurses, and specialist providers is important for ongoing management of those workers with mechanism-based therapies for chronic pain. This article examines collaborative care issues relative to nerve stimulation and intrathecal drug delivery systems.

Chronic pain can have a significant effect on both workers and the workplace. Chronic pain has physical, psychological, and psychosocial components affecting mobility, strength, endurance, mental status, emotional balance, and social interactions. Workers with chronic pain are often misunderstood and their requests for workplace accommodations may be met with skepticism.

Remaining productive in the workplace is a continuous struggle for workers with fibromyalgia, arthritis, or neurological disease, as well as workers with chronic back pain, migraine headaches, multiple sclerosis, or peripheral neuropathy. Occupational health nurses may see a variety of new therapies (e.g., nerve stimulation and intrathecal [IT] drug delivery systems) for workers with chronic pain, as well as the application of new research findings for older treatments. By understanding the options available for managing chronic pain, occupational health nurses can assist employees to effectively use prescribed therapies to control chronic pain.

PREVALENCE AND IMPACT OF CHRONIC PAIN

Chronic pain is the nation's leading cause of adult disability (Roper Starch Worldwide, 1999). An estimated 50 to 75 million Americans have chronic pain (Battista & Reed, 2006). Unlike acute pain, chronic pain is not necessarily limited to the site of an injury and is not alleviated when a disease is adequately treated or an injury heals. Prevalence rates for chronic pain increase with age, peaking between 45 and 65 years. Chronic pain and chronic disease often occur together, specifically with musculoskeletal disorders, chronic pain disorder (persistent pain lasting months or years), and osteoarthritis (Rustoen et al., 2005).

Chronic pain in the workplace costs an estimated $100 billion (National Institutes of Health, 1998) and worker pain results in 50 million lost workdays (American Pain Foundation, n.d.) each year. Migraine, the most common recurrent severe headache, affects at least 12% of the U.S. adult population and is a leading cause of employee absenteeism and lost productivity (Wenzel, Dortch, Cady, Lofland, & Diamond, 2004). Goetzel et al. (2004) noted that presenteeism accounts for 61% of the total costs associated with 10 select health conditions including migraine and other headaches. Goetzel et al. also reported that presenteeism costs (e.g., loss of productivity) were higher than health care costs. Presenteeism is a self-reported measure of workplace productivity. It is measured by the percentage of time workers feel they are contributing fully in the workplace.

Back pain, the most frequently identified cause of lost work time and lower productivity, is the leading cause of disability in Americans younger than 45 years (American Pain Foundation, n.d.). In addition to lost workdays, lost productivity among those with chronic pain is substantial. Positive and negative changes in worker health risks are associated with same-direction changes in presenteeism (Burton, Chen, Conti, Schultz, & Edington, 2006). Stewart (2003) reported that the majority of lost productivity

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is related to impaired performance (12.7%) rather than absence from work (1.1%). Another study found that many individuals with upper back and neck pain, fatigue, and depression were among those with high presenteeism (Aronsson, Gustafsson, & Dallner, 2000).

Employees with chronic pain can be difficult to manage in the workplace because they require significant occupational health nursing time and resources to effectively address their concerns and maintain their productivity using ergonomic adaptations, flexible schedules, and other workplace modifications. Establishing a collaborative approach with neurology and neurosurgical specialists, primary care providers, and the occupational health team provides additional therapeutic options and accommodations for workers.

DIAGNOSING THE CAUSE OF CHRONIC PAIN

The first step in caring for workers with chronic pain is establishing a diagnosis that will lead to effective treatment. Differentiating between nociceptive pain (physiologic or somatic pain stimulated by noxious stimuli) and neuropathic pain (nerve pain related to sensory or motor axon damage) is the foundation of a diagnosis, as each type of pain responds to different treatment modalities. Physiologic pain is felt when peripheral nociceptors and intact sensory pathways are stimulated. An example is inflammatory pain originating from tissue injury or inflammatory mediators stimulating peripheral nociceptors. Peripheral neuropathic pain comes from both stimulus-independent and stimulus-dependent sources. The nerve damage may be intrinsic or extrinsic to the nervous system. Workers may describe this pain as burning, aching, jabbing, or lancinating. In peripheral neuropathy, sensitization of primary sensory afferent nerve pathways occurs, resulting in enhanced nerve excitability with increasing discharges from the dorsal root ganglia, damaged sensory terminals, and neuromas of injured nerves (Bromburg & Smith, 2005).

Occupational health nurses can teach workers to differentiate between life-threatening or progressive conditions and correctable problems (e.g., nerve root compression) that can be evaluated and addressed. Occupational health nurses can effectively elicit individual and family health histories and history of injury and medications from workers. They can also assess the workplace for exposure to neurotoxic substances. Significant relationships have been found between pain behavior and self-reported pain intensity, self-reported disability, and reported self-efficacy (McCahon, Strong, Sharry, & Cramond, 2005). Diagnosing and treating peripheral neuropathies caused by toxic agents is complex. Linking chronic pain in workers to toxic neuropathy requires vigilance by occupational health nurses as well as an understanding of chronic pain. The Bradford Hill Criteria provide an organized approach to determining the causal relationship between neuropathy and potential toxins (Bromberg & Smith, 2005). Chronic neuropathic pain increases over time. Occupational health nurses can refer workers to neurospecialists for neurodiagnostic testing (e.g., electromyography and nerve conduction studies). Most neurotoxins cause axonal sensory motor peripheral neuropathy.

TREATMENT FOR CHRONIC PAIN

The range of therapy options for workers with chronic pain includes physical and occupational therapy; nonsteroidal anti-inflammatory drugs; opioids and adjuvant medications such as antidepressants and antiepileptics; acupuncture, biofeedback, and other alternative therapies; and sometimes repeated surgery. Despite these options, many workers do not experience pain relief. Recent innovations in medication delivery systems, pharmacological advances, and innovations in conservative (i.e., nonsurgical) care are providing more options for improving the functional capacity of workers with chronic pain. Some workers with chronic pain may be candidates for mechanism-based treatments such as spinal cord stimulation and IT drug therapy.

Spinal Cord Stimulation

Spinal cord stimulation for pain relief, based on the "gate control theory" (Melzack & Wall, 1962), stimulates large-diameter nerve fibers inhibiting small fiber input to the brain. Spinal cord stimulation requires implanting an electrode connected to a pacemaker-type device. The electrode is inserted percutaneously through a mini-laminotomy under local anesthesia. Positioning is advanced with the client awake to guide the surgeon for "best pain coverage." Clients control the intensity of stimulation by regulating voltage and rate using a radiotelemetry console programmer. Spinal cord stimulation works best for clients with lower extremity (radicular) pain. Indications for spinal cord stimulation include:

- Failed back pain syndrome.
- Phantom limb and stump pain.
- Ischemic pain.
- Back and lower extremity pain related to adhesive arachnoiditis (i.e., inflammation of the arachnoid membrane surrounding the spinal canal).
- Causalgia (i.e., complex regional pain syndrome).

Spinal cord stimulation is usually considered before IT drug delivery. Complications are rare but can include spinal cord injury and infection.

IT Drug Delivery

IT drug delivery therapy is indicated for workers who have:

- A definable cause of pain.
- No surgically correctable pathology.
- Risk of surgery outweighing the potential benefits.
- No serious untreated drug habit.
- Pain that is intractable to less complex, less invasive therapies.
- No health issues that preclude surgery.
- Successfully completed psychological evaluations.
- No contraindications to implantation.

IT therapy should be considered when the pain intensity is unacceptable despite optimized adjuvants or opioid dose escalation or when side effects from oral medications are intolerable. The correct pharmaceutical agent, spinal level for catheter tip placement, and method of delivery are guided by the character, pattern, and intensity of the pain. IT therapy is an evolving process requir-

ing consistent monitoring and repeated assessments. The implantable pump is reprogrammed with each refill. The newer pumps typically hold 20 to 40 cc of drug solution. Delivery of opioids and other adjuncts through the IT system allows for significantly lower doses of morphine and hydromorphone. Clonidine is sometimes used as an adjuvant, especially with neuropathic pain. IT clonidine, hydromorphone, and bupivacaine have not been approved by the Food and Drug Administration but are sometimes administered for compassionate off-label purposes.

Co-managing workers with chronic pain using IT pumps is often difficult in the workplace due to complex interactions between systemic diseases and treatment modality. The risks of IT pumps are usually divided into two main areas of concern: pharmacological side effects related to the medications and the mechanical complications of the pump systems. Co-managing these complex individuals requires ongoing communication among primary care providers, specialists, and occupational health nurses. Occupational health nurses can link at-work observations and functional assessments with workers' self-reported measures of pain, intensity, disability, and self-efficacy. Self-efficacy is defined as the degree of control client feel over their ability to manage pain. Workers who feel they can control their pain are more likely to exhibit higher levels of presenteeism in the workplace. Occupational health nurses who are trained to use chronic pain assessment tools and understand the goals of therapeutic treatment modalities to address chronic pain are valuable resources for both employers and employees because they can help to bolster work self-efficacy.

Mechanical Complications of IT Therapy

Mechanical complications of IT drug delivery include catheter disruption (e.g., disconnection or fracture of the catheter), infections, and, rarely, pump failures. Occasionally, the catheter will become kinked or occluded with sediment from drug precipitation. Catheter tip–associated benign granuloma formation may present with sudden loss of analgesia or new neurological symptoms. Magnetic resonance imaging can evaluate catheter disruption. Fluoroscopic evaluation is sometimes needed to assess occlusions for the provider to determine the area of concern. The neurospecialist will evaluate a rotor study under fluoroscopy to assess suspected pump mechanism problems. The pumps are programmed to audibly alert individuals when they are malfunctioning. Most often, clients complain the medication is no longer covering their pain effectively. Infections, either local or systemic, present with the usual signs and symptoms of sepsis (e.g., fever or inflammation). Together, primary care providers and neurospecialists must differentiate nerve root irritation from benign granuloma formation and exacerbation of existing disease processes.

Pharmaceutical Complications

Long-term use of opioids for chronic non-cancer pain is becoming more common. Opioid use during rehabilitation does not necessarily preclude treatment success. Return-to-work data revealed no significant differences in functional restoration outcomes between opioid users and nonusers. Workers using opioids to counter neuropathic pain can return to work in carefully controlled situations. However, some safety-sensitive areas may preclude workers using opioids. Workers may need to restrict their activities at the beginning of opioid therapy as well as when adjusting the dose after an initial or stable dose has been determined (Antoin & Beasley, 2004). Many states consider driving while under the influence of a controlled substance an illegal activity. Workers are responsible for determining if they are fit to drive. It is the employer's responsibility to decide if workers can safely perform job functions while taking opioids.

Side effects of opioids include nausea, vomiting, pruritis, urinary retention, constipation, sedation, and respiratory depression. Opioids also have substantial hormonal effects (e.g., decreases in plasma cortical, testosterone, and estrogen levels). Opioid receptors have also been found in immune cells affecting immunosuppression. More research is required as to the mechanisms for this immunosuppression.

Tolerance and addiction are two primary concerns for workers and occupational health nurses when workers are prescribed oral or IT opioid medications. Tolerance (i.e., the escalation of opioid dose to achieve the same effect) is sometimes considered evidence of addiction. Assessing tolerance can be difficult with IT opioid administration. Tolerance is more common in workers with non-cancer pain. The authors define tolerance as an IT morphine dose greater than 25 mg/d or concurrent administration of an alternate narcotic because of inadequate pain control in the absence of disease progression or other systemic problems. The goal of IT analgesia is to manage pain—not to obliterate it. Most workers with IT pumps do not achieve complete relief of their chronic symptoms; however, significant improvements can be achieved in functional and coping mechanisms.

A thorough neuropsychological evaluation preimplantation is needed. Candidates for pump implants with psychopathological or substance abuse problems or unresolved issues with secondary gains may not be accepted for IT therapy until these issues are addressed and reevaluated.

Although the true incidence of addiction in long-term opioid use has not yet been determined, it is estimated to occur in approximately 10% of clients (Antoin & Beasley, 2004). Occupational health nurses must be aware of the warning signs of addiction and abuse including unauthorized dose escalation, lost or stolen prescriptions, prescription forgery, concurrent illicit drug use, visits without appointments or failure to keep appointments, intolerance of multiple opioids, excessive consumption of opioids (e.g., running out of medication early), frequent phone calls especially after hours, borrowing drugs from others, and using multiple prescribers. In the workplace, occupational health nurses may note increasing absenteeism, changes in mentation or personality, and decreased productivity.

An advantage of IT drug administration is potency (1 mg of IT morphine is equal to 300 mg taken orally). Work-

IN SUMMARY

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1. Chronic pain has significant effects on workers and the workplace.
2. New therapies for treating chronic pain, such as nerve stimulation and intrathecal drug delivery, are becoming more common in the workplace.
3. Occupational health nurses can be advocates for workers to differentiate between life-threatening and progressive problems related to chronic pain and correctable problems.
4. Occupational health nurses need to understand mechanism-based pain relief modalities and their implications for the workplace.

ers are encouraged to keep a small supply of oral medication for breakthrough pain or abrupt disruption of IT drug administration (e.g., catheter fracture or occlusion).

Although the side effects of IT medication administration may seem excessive, these workers have already tried more conservative opioid administration options without achieving acceptable pain control. One of the major problems with IT therapy is the difficulty differentiating between medication side effects and disease effects. The most frequently reported side effects of IT opioid administration are nausea and vomiting, sedation, urinary retention, pruritis, myoclonic activity, and respiratory depression.

Most individuals choose a trial of IT drug administration through an externally placed catheter prior to the implantation of an IT pump delivery system. This allows neurospecialists and clients to ascertain if IT drug administration can effectively decrease pain and still allow clients to function safely in the workplace, community, and home. During this trial period, some workers experience transient nausea and vomiting, often decreasing after the first 24 to 48 hours and usually dose related. Concurrent use of systemically administered breakthrough opioids may also contribute to nausea and vomiting.

Although rare, sedation and somnolence may occur with both oral and IT opioid medication administration, usually secondary to the delivery rate and dose. These symptoms can range from mild disorientation and fatigue to psychosis. Careful neuropsychological evaluation can assess for these changes.

Urinary retention is occasionally associated with IT opioid administration. However, retention is usually addressed prior to implantation during the trial period. Significant problems are related to the effect of the medication on detrusor and abdominal musculature and the opioid effect on afferent input. Sometimes it is difficult to differentiate between disease-related urodynamic changes and drug-induced effects. For example, workers with multiple sclerosis taking baclofen may already experience bladder problems. Sometimes the issue is urinary retention and overflow, and sometimes it is incontinence. These workers should be referred to urologists to evaluate the urodynamic issues and incontinence specialists for behavioral and nutritional therapies. In workers with multiple sclerosis, urinary tract infections may not present with the usual signs and symptoms. Workers may report increased spasticity or tone. Urinary tract infections should be evaluated using appropriate screening tests, such as urine cultures.

The literature reports that pruritis occurs in approximately 17% of adults and is one of the more bothersome side effects of IT opioid administration. Subcutaneous narcan may decrease pruritis during the trial period.

Myoclonic activity is rarely observed with IT drug administration unless extremely high doses of opioid are used for workers with cancer pain. However, myoclonic activity is a well-known complication of opioid administration, regardless of delivery route. Anticholinergic effects at the spinal level or the effect of morphine metabolites have been linked to myoclonic activity. Although this is usually related to the amount of opioid administered, baclofen can be used for symptom control.

Respiratory depression is a rare but serious side effect. Care must be taken when refilling and reprogramming the pump to prevent bolus administration of the opioid. Lower extremity edema often occurs with morphine (a smooth muscle relaxant) administration. Diuretics, support stockings, and hydromorphone rather than morphine will decrease edema while increasing worker comfort. Less common side effects of opioid administration include constipation, incontinence, polyarthralgia, sweating, amenorrhea, altered sexual function, and altered libido.

ROLE OF THE OCCUPATIONAL HEALTH NURSE

Collaboration between occupational health nurses and community health care providers managing IT drug therapy is a critical component in selecting and monitoring workers using IT drug administration. The role of the primary care provider is to assess the effect of IT drug administration on other systemic diseases. The role of the neurospecialist is to ensure that IT drug therapy is providing significant functional and coping improvements with minimal side effects. The role of the occupational health nurse is to assess the effectiveness of the drug delivery system regarding worker health, safety, and productivity in the workplace. Careful monitoring and in-depth worker education are necessary to successfully manage chronic pain with IT delivery systems.

SUMMARY

Occupational health nurses must understand the options available for managing chronic pain. As mechanism-based therapies become more common, occupational health nurses will care for more workers with chronic pain who are returning to the workplace. Occupational health nurses can document the functional capacity of these workers and assess their responses to various pain-control modalities while they work. Occupational health nurses can also serve as resources for workers with chronic pain by developing an appreciation for the relationship between self-reported measures of pain intensity and disability and observed pain behaviors. Consistent communication among the occupational health team, case managers, primary care providers, and neurospecialists is an important component in meeting the needs of workers with chronic pain. Occupational health nurses who understand the array of therapeutic interventions available for chronic pain management are key to improving workers' adaptive skills and maintaining their productivity.

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