A REPORT TO THE INDUSTRY

Pain Management and the Use of Opioids in the Treatment of Back Conditions in the California Workers' Compensation System

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Foreword

Pain management is an evolving and controversial subject in the treatment of both occupational and non-occupational illness and injury – especially the use of opioids to treat acute and chronic pain. The main objectives of this study were to measure the prevalence of opioid use in job injury claims where the primary diagnosis was a back condition without spinal cord involvement, and to determine the associations between the use of opioids for these back conditions and key outcomes such as cost and length of disability. The study population consisted of a sample of 166,336 workers' compensation claims for back conditions without spinal cord involvement, with dates of injury between January 2002 and November 2005. Medical treatment data, including diagnosis codes, procedure codes, benefit payments and filled prescriptions through December 2006 were compiled for each injured worker in the study population. The quantities of opioids dispensed to the workers in the study population were defined using two measures:

1) The number of filled opioid prescriptions per claim; and

2) The total morphine equivalent milligrams associated with filled opioid prescriptions (opioid medications for which the morphine equivalent dosage could be determined).

The results document widespread use of opioids among injured workers suffering back conditions without spinal cord involvement. One out of four injured workers in the study population received one or more opioid prescriptions, and this subsample of workers averaged 5.2 opioid prescriptions per claim. Approximately 14 percent, or about 1 in 7 injured workers in the sample, received a prescription for which the prescribed opioid dose could be converted into morphine equivalent milligrams; and in those cases there was an average of 2,294 morphine equivalent milligrams dispensed per claim.

While the injured workers who received modest levels of opioids (one prescription or less than 240 morphine equivalent milligrams) had outcomes that were statistically similar to those who received no opioids, those involving a greater number of opioid prescriptions or morphine equivalent milligrams were associated with higher costs and longer temporary disability durations. Average claim costs of workers receiving seven or more opioid prescriptions were three times more expensive than those of workers who receive zero or one opioid prescription, and these workers were 2.7 times more likely to be off work and had 4.7 times as many days off work.

These findings suggest that greater use of opioid pain medication is associated with adverse outcomes among workers with occupational back conditions that do not involve the spinal cord.

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Background

The Journal of the American Medical Association (2008) describes pain as "an unpleasant sensory and emotional experience usually arising from actual or potential tissue damage." For many, the pain associated with tissue damage or inflammation is "acute" -- lasting up to several weeks. "Chronic pain," on the other hand, is pain lasting more than several weeks. Chronic pain consists of pain associated with chronic medical conditions, neuropathic pain (resulting from nerve damage) and psychogenic pain (pain associated with no apparent disease or injury). Thus, pain can have many different underlying causes, and is a very subjective experience. Is it any wonder that medical treatment protocols for pain are complicated and often controversial?

In many cases, the conventional therapy for pain can mean prescription of a group of analgesic medications known as opioids.[1] Opioids used to manage pain associated with life-shortening diseases, like cancer, have a unique set of issues and controversies, including serious debate about whether medical providers tend to underuse opioids in situations where addiction is not a relevant concern.

However, the use of opioids to address non-cancer chronic pain is also controversial. The controversy over the use of opioids to treat pain associated with non-cancer chronic conditions, like low back strain, generally centers on whether opioids are being overused. To understand the controversy about the use of opioids in the treatment of non-cancer chronic pain, one must first understand what opioids are, how they work, and the real and potential effects and associated risks.

Opioids can be natural, semi-synthetic or wholly synthetic. The naturally occurring opioids are derived from opium. Morphine and codeine are the only two of these naturally occurring opioids that relieve pain. Semi-synthetic opioids include hydromorphone, oxymorphone and oxycodone. Examples of wholly synthetic opioids include levorphanol, fentanyl, methadone, propoxyphene and meperidine.

Controlled substances such as opioids are classified by the United States Drug Enforcement Administration either according to their addictive potential or based on historical factors.[2] There are five levels, or schedules, of drugs that have addictive potential. In general, Schedule I is a list of drugs with the most addictive potential, and Schedule V is a list of the least addictive drugs. For example, among opioids, heroin is a Schedule I drug; fentanyl, hydromorphone, pure hydrocodone, pure codeine and morphine are classified as Schedule II drugs; and hydrocodone or codeine compounded with a non-steroidal anti-inflammatory drug such as acetaminophen are classified as Schedule III drugs. Tramadol is an atypical opioid not classified as a controlled substance.

Opioid medications reduce pain by binding to a variety of pain receptors in the central nervous system, including the brain and spinal cord, as well as to receptors in other parts of the body. Different types of opioids bind to different receptors causing various results in addition to the reduction of pain. Common side effects of opioid use include respiratory depression, nausea, constipation, vomiting, itching, euphoria, drug tolerance and addiction. (See Appendix C—Literature Review: Side Effects and Risks of Opioid Use.) Side effects generally increase with dose. Because responses to opioids can vary from person to person, and because development of tolerance can be addressed by changing the specific type of opioid, it is common for a physician to prescribe more than one analgesic or opioid during a course of treatment for any given individual. The existence of multiple opioid substances, each interacting with more than one receptor, makes opioid prescribing and management a challenge.

When treating acute or sub-acute pain with a clear, physiological source and significant objective physical findings, opioid use is often based upon the belief that the pain relief that opioids provide is superior to that provided by other analgesic medications (even if these have not been tried). Management of pain during post-surgical recovery and in individuals with cancer are examples of this type of acute pain. However, opioids are also used for individuals with chronic, non-cancer pain, also known as "chronic nonmalignant pain" (CNMP), which is pain associated with a chronic disease process. Often the exact source of a patient's CNMP is uncertain. Such is frequently the case with the pain associated with back conditions.

1 Opioids are morphine-like medications that produce pain relief. The term opioid is preferred to the term narcotic; it refers to natural, semi-synthetic, and synthetic medications that relieve pain by binding to opioid receptors in the nervous system. The term "opioid" is also preferred to "opiate" because it includes all agonists (drugs that produce an action) and antagonists (drugs that act against and block an action) with morphine-like activity, as well as naturally occurring and synthetic opioid peptides.

2 The current official list of controlled substances can be found in Section 1308 of the most recent issue of Title 21 Code of Federal Regulations (CFR) Part 1300 to end (21 CFR §1308) and the final rules, which were published in the Federal Register subsequent to the issuance of the CFR.

There is widespread variability in the efficacy of opioids when used in the management of back pain and other CNMP conditions. The literature regarding the use of opioids in the management of CNMP indicates that they do not consistently and reliably relieve pain. There have been two recent systematic reviews and meta-analyses regarding the use of opioid medication in patients with chronic low back pain. The first (Martell et al, 2007) identified 15 studies comparing opioids with non-opioids, placebo, or opioid comparators. Six of these were high-quality studies that compared opioids with non-opioids or placebo over a mean study duration of 64 days (range 7 days to 16 weeks) and demonstrated that there was a substantial reduction in pain scores for all interventions, including placebo. Meta-analysis of the four studies that could be pooled indicated that the difference in pain in patients receiving opioid treatment compared with those receiving non-opioids (active controls) or placebo was not statistically significant. Five out of nine other trials testing pain levels before and after opioid treatment also were subjected to meta-analysis. The change in pain measurements between the baseline and the period after opioid treatment was again not statistically significant. The authors of these meta-analyses consequently suggested, "Clinicians should reconsider treating chronic back pain patients with opioid medications, and consider other treatments with similar likelihood of benefit that have fewer long term adverse effects."

The second recent systematic review (Deshpande 2007) of opioid use for low back pain (LBP) identified four trials as suitable for inclusion. Three compared tramadol to placebo and found the former to be more effective. One comparative trial found that there were statistically significant differences between opioids and another analgesic (naproxen) in relieving pain, but not in improving function. However, the authors noted that these trials were characterized by a lack of generalizability, inadequate description of study populations, poor intention-to-treat analysis, and limited interpretation of functional improvement. The conclusion was that the "benefits of opioids in clinical practice for the long-term management of chronic LBP remains questionable," with a need for further high-quality studies to assess the usefulness and potential risks of opioids for individuals with chronic LBP.

Opioid use in the management of CNMP also frequently fails to increase quality of life or functional status, especially over the long run, when opioids are compared to active, non-opioid alternatives. Two studies confirmed that opioid treatment of CNMP not only did not relieve pain, it also did not improve quality of life or functional capacity. The authors concluded that further study should be conducted on the effect of opioids on both quality of life and depression (Joranson et al 2000, Eriksen et al 2006). Development of the adverse effects of opioid use, both short-term (constipation, nausea, drowsiness) and longer-term (tolerance, physical dependency, addiction, impotence, and opioid-related increased pain) may explain the deleterious impact on quality of life and functional status.

Thus, the treatment of CNMP, and chronic musculoskeletal pain in particular, remains controversial (McNicol et al 2005). Given the information derived from both high-quality systematic reviews and descriptive epidemiological studies, and the "first principles"[3] upon which the American College of Occupational and Environmental Medicine (ACOEM) Guidelines are based, ACOEM has recommended the following:

- Opioids should be used in acute musculoskeletal pain only when there is significant objective evidence of injury, when other medications such as NSAIDs and acetaminophen are contraindicated, or on a very limited basis if other medications have failed to control pain in the short term (up to 3 weeks after acute injury).
- In chronic pain, in infrequent instances, short-term use of an opioid may occasionally be helpful during the initial active physical rehabilitation of persons with objective evidence for deconditioning, increased pain with exercise, and (fear avoidant) chronic pain behavior during initial therapy to facilitate physical activation if other means of temporary reduction in the musculoskeletal pain that increases with exercise, such as heat, acetaminophen or NSAIDs, are ineffective. In that setting, the judicious, short-term use of one non-combination, short-acting narcotic like oxycodone or codeine may be indicated. A maximum duration of four weeks is suggested.
- In rare situations when a patient derives clear functional benefit from opioid use, continued use may be indicated with careful management.

3 The "first principles" upon which the ACOEM guidelines are based are "to refrain from recommending treatment that has not been clearly demonstrated to improve on the natural history of disorder, especially if potential harms are personally or socially significant" (Harris JS, Hegmann KT, Holland JP, Sinnott P, Torkelson C, Weiss M. The ACOEM Occupational Medicine Practice Guideline Methodology updated. JOEM, submitted for publication).

Study Objectives

Opioid use is widespread in the workers' compensation system. Recent data compiled on pharmaceutical use showed that 29 percent of all prescriptions in the California workers' compensation system were for narcotics (Ireland 2007). The main objectives of this study are to measure the prevalence of opioid use in treating back conditions that do not involve the spinal cord (one of the most common conditions in the California workers' compensation system), and to determine associations between the use of these drugs and key outcome factors for this type of injury.[4]

Data

This research utilized administrative data on medical benefits, indemnity benefits, prescribed medication and drug descriptive detail (including National Drug Codes[5]) compiled from the California Workers' Compensation Institute's Industry Claims Information System (ICIS). These data were contributed by national and regional (California) workers' compensation insurers, as well as large self-insured employers. ICIS data include open and closed workers' compensation claims from a broad sample of workers' compensation insurance carriers and self-insured employers from various industry sectors. Claim and policy characteristics in the ICIS database have been shown to be representative of those found in the overall population of California workers' compensation claims (Lewin et al, 2008). The database contains medical and pharmaceutical information on more than 55 percent of the California workers' compensation market.

The study sample consisted of claims with conditions classified as "Medical Back Problems Without Spinal Cord Involvement" with dates of injury between January 2002 and November 2005. Medical treatment data, including diagnosis codes, procedure codes, benefit payments and filled prescriptions through December 2006 were compiled for each injured worker in the study population. The ICIS database uses a commercial diagnosis grouper that determines the primary, secondary and tertiary diagnoses for a claim using the array of all ICD-9 codes submitted, and then cross-walks these codes to one of 500 diagnosis categories.[6] In order to maximize the homogeneity of the study sample, the final dataset was limited to claims for which all three leading diagnosis codes could be grouped into the Medical Back Problems Without Spinal Cord Involvement diagnosis category. Table 1 shows the distribution of primary diagnosis codes for the final sample of 166,336 claims.

Table 1: Distribution of Primary Diagnosis

ICD9	Primary Diagnosis	Claims	Percent of Sample
847.2	Sprain Lumbar Region	59,738	35.9%
846.0	Sprain Lumbosacral	28,374	15.2%
847.0	Sprain of Neck	27,148	16.3%
847.1	Sprain Thoracic Region	15,681	9.4%
724.2	Lumbago	9,449	5.7%
724.5	Backache NOS	5,208	3.1%
847.9	Sprain of Back NOS	4,935	3.0%
722.52	Lumbar/Lumbosacral Disc Degeneration	3,542	2.1%
723.1	Cervicalgia	2,963	1.8%
846.9	Sprain Sacroiliac NOS	2,300	1.4%
722.4	Cervical Disc Degeneration	834	0.5%
724.6	Disorders of Sacrum	798	0.5%
847.3	Sprain of Sacrum	776	0.5%
724.1	Pain in Thoracic Spine	595	0.4%
722.6	Degeneration of Intervertebral Disc, Site Unspecified	564	0.3%
846.1	Sprain Sacroiliac	534	0.3%
724.8	Other Symptoms Referable to Back	339	0.2%
846.8	Sprain Sacroiliac NEC	286	0.2%
	All Others	2,272	1.4%
	Total	**166,336**	**100.0%**

4 Back conditions without spinal cord involvement comprise 21 percent of workers' compensation claims in California and 31 percent of all workers' compensation benefit costs. ICIS Injury Scorecard Series #1: Medical Back Problems Without Spinal Cord Involvement. CWCI. March 2007.

5 Drug products are identified and reported using a unique number called the National Drug Code (NDC) which is a universal product identifier for human drugs maintained by the Federal Drug Administration (FDA). These ten-digit numbers identify the labeler (or manufacturer), product, and trade package size.

6 The grouper, Dyani Diagnosis Grouper, was provided by Axiomedics Research Inc. Dyani uses a proprietary algorithm that has been described in several studies including Smithline (1990), Swedlow (2002), and Gardner (2002).

Claims in the final data sample involved a total of 812,663 prescriptions with fill dates between January 2002 and April 2006, which contained 11,373 distinct NDC codes. To identify and group the NDC codes into products by drug name, the authors assigned each NDC a "common trade name" -- either a commonly recognized brand name, a generic equivalent, or both. This grouping resulted in 103 distinct drugs that comprised 93 percent of the prescriptions included in the dataset (Appendix A). The 103 drugs were then further summarized into 18 drug classifications. Table 2 shows the drug classifications and the distribution of prescriptions in the study sample:

Table 2: Distribution of Drug Classification

Drug Classification	Number of Prescriptions	Percent of Prescriptions
NSAID	217,119	26.7%
Opiate Agonist[7]	213,903	26.3%
Muscle Relaxant	160,746	19.8%
Acid Suppressants	48,409	6.0%
Anti-Depressant	25,748	3.2%
Anti-Anxiety	14,977	1.8%
Pain Relief Ointment	13,987	1.7%
Sleep Medication	12,946	1.6%
Anti-Convulsant	11,686	1.4%
Non-Narcotic Analgesic	8,678	1.1%
Steroid	8,402	1.0%
Local Anesthetic	7,724	1.0%
Nutritional Supplement	5,112	0.6%
Antibiotic	2,112	0.3%
Laxative	1,198	0.2%
Antihistamine	780	0.1%
Alpha Agonist	294	0.0%
Opiate Partial Agonists	285	0.0%
Not Classified	58,557	7.2%
Total	**812,663**	**100.0%**

It can be seen from Table 2 that opioids represented more than one out of four prescriptions filled by the injured workers in the study sample.

Equianalgesic Dose

Not all opioids have the same analgesic potency and the method by which an opioid is administered also has an impact on the analgesic effect. For example, 7.5 milligrams of oral hydromorphone is as potent as 30 milligrams of oral morphine. At these doses these two drugs are considered equianalgesic. Similarly, 30 milligrams of oral morphine is equianalgesic to 10 milligrams of morphine administrated intravenously.[8] Equianalgesic dose tables are most often used by physicians to titrate pain medication when determining the most beneficial drug, dose and administrative mode for a particular patient.

The category of drugs known as "opiate agonists" is a subset of opioids in which each drug has a known and applied equianalgesic dose. To adjust for variations in analgesic potency, the authors applied an equianalgesic dose conversion table to the dosage information available for the opioid agonist subset of prescriptions. There is no single equianalgesic dose table generally accepted by the medical community for this purpose, although they are all similar in their equivalent dose levels. Any of several tables can provide a useful guideline for the purposes of equating opioid potency among various opioids. The authors chose a table developed by the American Pain Society (1999) and used originally for the treatment of pain among cancer patients. This table is also used by many clinical research institutions when developing methods to assist physicians in titrating dosages to effectively medicate patients with pain, including Massachusetts General Hospital and Oregon Health Sciences University.

The American Pain Society equianalgesic dose table provides information that allows the user to convert specific opioid doses to a "morphine equivalent" dose. The formula to convert a drug to its morphine equivalent is the following:

$$\frac{30 \text{ milligrams morphine}}{\text{equivalent dose from table}} = \text{x morphine equivalents} \div \text{drug dose to be converted}$$

7 The opiate agonist count of prescriptions and the associated percent of prescriptions include the total of opiate agonist prescriptions with assigned morphine equivalent milligrams (18.3% of total prescriptions) and opiate agonist prescriptions without assigned morphine equivalent milligrams (8.0% of total prescriptions).

8 Because the data used in this study were limited to outpatient prescriptions, the type of administration associated with the drugs in the study sample was oral in more than 99 percent of the prescriptions.

The following example shows how to convert 5 milligrams of oxycodone to its morphine equivalent dose. The morphine equivalents table indicates that the dosage of oral oxycodone that is equivalent to 30 milligrams of morphine is 20 milligrams. Using the formula, we then solve for x:

$$\frac{30 \text{ mg. morphine}}{20 \text{ mg. oxycodone}} = \frac{x \text{ morphine equivalents}}{5 \text{ mg. oxycodone}}$$

$$1.5 = \frac{x}{5}$$

$$= 7.5 \text{ mg. (e.g., 7.5 mg. of morphine is the equivalent of 5 mg. oxycodone}$$

1) The number of filled opioid prescriptions

2) The total morphine equivalent milligrams associated with filled opioid prescriptions.

Using the first method of classification, the authors developed five opioid usage categories: Claims that had no opioid prescriptions comprised the first category; claims with one opioid prescription made up the second category; claims with two or three opioid prescriptions became the third category; claims with three to seven opioid prescriptions comprised the fourth category; and the final category consisted of claims with more than seven opioid prescriptions. Descriptive statistics about these categories are provided in Table 3.

Of the 166,336 injured workers analyzed in the study sample, 25 percent received one or more opioid prescriptions, and those prescribed this type of medication averaged 5.2 opioid prescriptions per claim. During the period of the study, the number of opioid prescriptions in these claims ranged from 1 to 206 prescriptions. One out of 12 (8.5 percent) of the injured workers in the study sample received 4 or more opioid prescriptions.

Table 3: Number of Opioid Prescriptions by Claim Type and Category

	Med Only Claims	Indemnity Claims	Total Claims	Percent of Total
No Opiates	82,502	42,847	125,349	75.4%
1 Prescription	7,550	9,124	16,674	10.0%
2 – 3 Prescriptions	2,422	7,686	10,108	6.1%
4 – 7 Prescriptions	840	5,886	6,726	4.0%
> 7 Prescriptions	347	7,132	7,479	4.5%
Total (Claims w/ Prescriptions)	11,159	29,828	40,987	24.6%
Total (All Claims)	93,661	72,675	166,336	100.0%

The authors also developed five categories of usage based on the quantity of morphine equivalent milligrams used. The first category consisted of claims with no morphine equivalent milligrams. The boundaries of the remaining categories were determined by using cut-offs at percentile levels similar to those of the categories used for number of opioid prescriptions. There were fewer claims (146,641) in the sample because claims with prescriptions for opioids for which no morphine equivalent dosage could be assigned were excluded Descriptive statistics about these categories are provided in Table 4.

Table 4: Number of Milligrams of Morphine Equivalents in Filled Prescriptions by Claim Type and Morphine Equivalent Category

Claim Category	Med Only Claims	Indemnity Claims	Total Claims	Percent of Total
No MEs	82,530	42,853	125,383	85.6%
Level 1 (>0 and <=240 MEs)s	5,405	5,795	11,200	7.6%
Level 2 (>240 and <=650 MEs)	1,025	3,280	4,305	2.9%
Level 3 (>650 and <=2,100 MEs)	380	2,542	2,922	2.0%
Level 4 (>2,100 MEs)	174	2,657	2,831	1.9%
Total (Claims w/MEs)	6,984	14,274	21,258	14.4%
Total (All Claims)	89,514	57,127	146,641	100.0%

Approximately 14 percent (or about 1 in 7) injured workers in the sample received one or more morphine equivalent milligrams over the course of the study period. Claims with morphine equivalent milligrams had an average of 2,294 milligrams per claim.

Case Mix Adjustment

When comparing outcomes among non-randomized groups, case mix adjustment is important because it "levels the playing field" by controlling for the effects of factors other than those being analyzed that may influence the outcome(s) of interest. Researchers use regression analysis to adjust for differences in the mix of independent variables between groups. In analyses of workers' compensation data, these variables include claimant demographics such as gender, age and marital status; average weekly wage; tenure; nature of injury; body part; cause of injury; occupation; claim type; attorney involvement; governing class of the employer; and year of injury. In this study, the authors used linear regression models to adjust for case mix while simultaneously estimating the relationships between the number of opioid prescriptions or the total morphine equivalent milligrams and several different outcome measures. The outcomes analyzed included:

- Average paid medical benefits per claim
- Average paid indemnity benefits per claim
- Average lost time from work (number of paid temporary disability days)
- Likelihood of attorney involvement
- Likelihood of lost time from work (indemnity status)
- Likelihood of open claim status

Additional details of the regression output used in the analysis are available in the Research section of the CWCI website at www.cwci.org.

Separate case-mix-adjusted models were used to test for associations between opioid levels and claim outcomes for all claims and for indemnity claims. Indemnity claims made up 39 percent and 44 percent of the opioid prescription and morphine equivalent claim samples, respectively, and more than 90 percent of the total benefits paid on behalf of the injured workers in the study population.

The average amounts paid for total benefits, medical benefits, and indemnity benefits[9] by opioid usage categories are provided in Tables 5-8. The data on the right side of the tables show the percentages by which average paid benefits were higher for a given usage category compared to the category that had no opioid usage.

9 Indemnity benefits consist of temporary disability and permanent disability payments. Temporary disability benefits are payments made directly to injured workers to compensate them for lost-time days. Payments are calculated at approximately two-thirds of an injured workers pre-injury weekly wage. These payments are subject to various restrictions on length of time and maximum earning caps. (For more detail see Swedlow, A., Ireland, J. Analysis of California Workers' Compensation Reforms Part 2: Temporary Disability Outcomes Accident Years 2002 – 2005 Claims Experience. Research Update. CWCI. January 2008.) Permanent disability benefit payments are made to injured workers for compensation against the permanent effects of the occupational injury.

Table 5: Average Benefit Payments by Opiate Agonist Level
Medical Backs With No Spinal Cord Involvement Injuries – All Claims

	Average Paid Benefits			Percentage Payment Increases by Level of Opiate Agonist Prescriptions		
# of Opiate Agonist Prescriptions	Total Benefits	Medical	Indemnity	Total Benefits	Medical	Indemnity
No Opiates	$6,598	$3,169	$3,429			
1 Prescription	$6,658*	$3,049*	$3,609*	0.9%	-3.8%	5.2%
2 – 3 Prescriptions	$9,932	$4,151	$5,781	50.5%	31.0%	68.6%
4 – 7 Prescriptions	$14,669	$5,960	$8,709	122.3%	88.1%	154.0%
> 7 Prescriptions	$20,945	$9,132	$11,813	217.4%	188.2%	244.5%

* p > .05, not a statistically significant difference from the baseline.

Results

I. Analyses of Opioid Prescriptions

Table 5 shows that claims involving more than one opioid prescription are associated with higher case-mix-adjusted average costs. Claims with no opioid prescriptions had an average of $6,598 in case-mix-adjusted total benefit payments. Case-mix-adjusted average total benefit payments were 50 percent higher ($9,932) when there were 2 or 3 filled opioid prescriptions; 122 percent higher ($14,669) when there were 4 to 7 filled opioid prescriptions; and 217 percent higher ($20,945) when there were more than 7 filled opioid prescriptions.

Case-mix-adjusted average medical payments were 188 percent higher when there were more than 7 filled opioid prescriptions. Similarly, case-mix-adjusted average indemnity payments were 244 percent higher when there were more than 7 filled opioid prescriptions.

Table 6 shows that among indemnity claims, greater numbers of opioid prescriptions were also associated with higher total benefit payments. Indemnity claims with no opioid prescriptions averaged $17,505 in case-mix-adjusted total benefit payments. Case-mix-adjusted average payments were 8 percent higher ($18,887) when there was one filled opioid prescription, 28 percent higher ($22,444) when there were 2 or 3 filled opioid prescriptions, and 80 percent higher ($31,580) when there were more than 7 opioid prescriptions.

Case-mix-adjusted average medical payments ranged from 3.3 percent higher when there was one filled opioid prescription to 78 percent higher when there were more than 7 filled opioid prescriptions. Likewise, case-mix-adjusted average indemnity payments on indemnity claims ranged from 11 percent higher when there was one filled opioid prescription to 82 percent higher when there were more than 7 filled opioid prescriptions.

Table 6: Average Benefit Payments by Opiate Agonist Level
Medical Backs With No Spinal Cord Involvement – Indemnity Claims Only

	Average Paid Benefits			Percentage Payment Increases by Level of Opiate Agonist Prescriptions		
# of Opiate Agonist Prescriptions	Total Benefits	Medical	Indemnity	Total Benefits	Medical	Indemnity
No Opiates	$17,505	$7,474	$10,031			
1 Prescription	$18,887	$7,720*	$11,167	7.9%	3.3%	11.3%
2 – 3 Prescriptions	$22,444	$8,920	$13,524	28.2%	19.3%	34.8%
4 – 7 Prescriptions	$26,560	$10,558	$16,002	51.7%	41.3%	59.5%
> 7 Prescriptions	$31,580	$13,337	$18,243	80.4%	78.4%	81.9%

* Not a statistically significant difference from the baseline.

Table 7: Average Benefit Payments by Morphine Equivalent Level
Medical Backs with No Spinal Cord Involvement – All Claims

	Average Paid Benefits			Percentage Payment Increases by Level of Milligrams of Morphine Equivalents		
Morphine Equivalent Level	Total Benefits	Medical	Indemnity	Total Benefits	Medical	Indemnity
No MEs	$6,733	$3,207	$3,526			
Level 1	$6,499*	$2,938	$3,561*	-3.5%	-8.4%	1.0%
Level 2	$10,550	$4,411	$6,139	56.7%	37.5%	74.1%
Level 3	$14,950	$6,356	$8,594	122.0%	98.2%	143.7%
Level 4	$20,389	$9,488	$10,901	202.8%	195.9%	209.2%

* Not a statistically significant difference from the baseline.

II. Analyses of Morphine Equivalent Milligrams

Table 7 shows average benefit payments for the subset of claims that excludes those with opioid prescriptions for which there were no morphine equivalent data. The results indicate a strong, positive association between the number of morphine equivalent milligrams prescribed for back conditions without spinal cord involvement and case-mix-adjusted benefit payments. Claims with no morphine equivalent milligrams had average total benefit payments of $6,733 while case-mix-adjusted total benefit payments were 57 percent higher ($10,550) when there were between 240 and 650 morphine equivalent milligrams (Level 2), and 203 percent higher ($20,389) when there were more than 2,100 morphine equivalent milligrams (Level 4).

Case-mix-adjusted average medical payments were 196 percent higher for Level 4 claims compared with claims with no morphine equivalent milligrams, while case-mix-adjusted indemnity payments were 209 percent higher.

Table 8 shows that among indemnity claims in the sample, increasing levels of morphine equivalent milligrams per claim were also associated with higher case-mix-adjusted average total benefit payments. The case-mix-adjusted average total benefits paid among indemnity claims with no morphine equivalent milligrams was $17,968. The case-mix-adjusted average total benefits paid increased with each successive increase in total morphine equivalent milligrams; 3 percent higher ($18,489) for Level 1 claims; 27 percent higher ($22,744) when there were between 240 and 650 total morphine equivalent milligrams (Level 2); and 70 percent higher ($30,540) when there were more than 2,100 total morphine equivalent milligrams (Level 4).

The case-mix-adjusted medical payments averaged 77 percent higher at Level 4 when compared to indemnity claims with no morphine equivalent milligrams. Likewise, the case-mix-adjusted indemnity payments averaged 6 percent higher among claims in Level 1 and 65 percent higher for claims in Level 4 compared to indemnity claims with no morphine equivalent milligrams.

Table 8: Average Benefit Payments by Morphine Equivalent Level
Medical Backs With No Spinal Cord Involvement – Indemnity Claims Only

	Average Paid Benefits			Percentage Payment Increases by Level of Morphine Equivalents		
Morphine Equivalent Level	Total Benefits	Medical	Indemnity	Total Benefits	Medical	Indemnity
No MEs	$17,968	$7,609	$10,359			
Level 1	$18,489	$7,475*	$11,014	2.9%	-1.8%	6.3%
Level 2	$22,744	$9,118	$13,626	26.6%	19.8%	31.5%
Level 3	$26,177	$10,765	$15,412	45.7%	41.5%	48.8%
Level 4	$30,540	$13,496	$17,044	70.0%	77.4%	64.5%

* Not a statistically significant difference from the baseline.

Paid Temporary Disability Days

One of the most basic objectives of workers' compensation systems and the providers of medical services to injured workers is to facilitate return to work. For this analysis, the authors used the number of paid temporary disability days as a proxy for measuring return to work.

Tables 9 and 10 display the case-mix-adjusted average number of paid temporary disability days by opioid usage for all claims (including medical-only claims) and for indemnity claims only. As noted earlier in Tables 2 and 3, the usage categories consist of different proportions of medical-only and indemnity claims. Differences in the average number of paid temporary disability days, when analyzed among indemnity claims only, demonstrate the direct association between level of opioid use and lost time. However, the analysis of this association among all claims adds additional insight, in that it is a function not just of the number of temporary disability days when there is any lost time, but also of the underlying prevalence of lost time (indemnity status) among the overall claim population.

The analysis of all claims with no opioid prescriptions shows a case-mix-adjusted average of 21.1 paid lost-time days, while indemnity claims with no opioid prescriptions involved a case-mix-adjusted average of 61.8 lost time days (Table 9). Among all claims, those with more than seven opioid prescriptions had 370 percent more lost-time days on average (99.1) compared to claims that had no opioid prescriptions, while indemnity claims with more than seven opioid prescriptions averaged nearly 138 paid indemnity days, or 123 percent more than lost-time claims without opioid prescriptions.

Table 9: TD Days by Opiate Agonist Level Medical Backs With No Spinal Cord Involvement All Claims vs. Indemnity Claims

	Average # of TD Days Paid		Percentage Payment Increases by Level of Opiate Agonist Prescriptions	
# of Opiate Agonist Prescriptions	All Claims	Indemnity Claims	All Claims	Indemnity Claims
No Opiates	21.1	61.8		
1 Prescription	19.0	63.7*	-10.0%	3.1%
2 – 3 Prescriptions	32.5	79.1	54.0%	28.0%
4 – 7 Prescriptions	56.9	101.2	169.7%	63.8%
> 7 Prescriptions	99.1	137.8	369.7%	123.0%

* Not a statistically significant difference from the baseline.

All claims without morphine equivalent milligrams had a case-mix-adjusted average of 21.3 paid lost-time days, while indemnity claims without morphine equivalent milligrams had a case-mix-adjusted average of 62.9 lost-time days. Among all claims, those with Level 4 morphine equivalent usage had a case-mix-adjusted average of 88 lost time days, or more than 4 times that of all claims with no morphine equivalent usage. Among indemnity claims, those in the Level 4 category of morphine equivalent usage had a case-mix-adjusted average of nearly 128 lost-time days, or about double that of indemnity claims with no morphine equivalent usage.

Table 10: TD Days by Morphine Equivalent Level Medical Backs with No Spinal Cord Involvement All Claims vs. Indemnity Claims

	Average TD Days Paid		Percentage Payment Increases by Morphine Equivalent Level	
Morphine Equivalent Level	All Claims	Indemnity Claims	All Claims	Indemnity Claims
No Opiates	21.3	62.9		
1 Prescription	21.3*	66.9	-0.1%	6.4%
2 – 3 Prescriptions	38.8	84.2	82.2%	33.9%
4 – 7 Prescriptions	60.6	102.3	184.5%	62.6%
> 7 Prescriptions	88.0	127.9	313.1%	103.3%

* Not a statistically significant difference from the baseline.

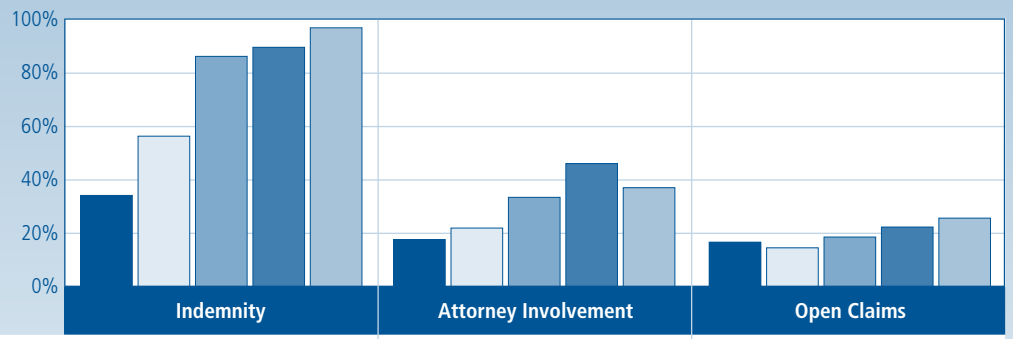
Likelihood Estimates

Logistic regression analyses were used to estimate the likelihood of indemnity payments, attorney involvement and open claim status by opioid usage category. The results of the analysis of the likelihood of indemnity costs showed that after controlling for all other factors, opioid usage was positively associated with the case-mix-adjusted likelihood of indemnity payments. The same association was found for the likelihood of attorney involvement and the likelihood of open claim status. These results are shown in Exhibits 11 and 12.

Exhibit 11 shows case-mix-adjusted likelihood estimates for each of the opioid prescription categories. For example, the likelihood of indemnity payments among claims with no filled opioid prescriptions was 34 percent – or one out of every three claims. When there was one opioid prescription, the likelihood of indemnity payments rose to 56 percent – well over half of all claims. When there were two or three opioid prescriptions, the likelihood of indemnity payments was more than 86 percent, while that likelihood rose to nearly 90 percent among claims that had 4 to 7 opioid prescriptions, and to 94 percent of the claims that had more than 7 opioid prescriptions.

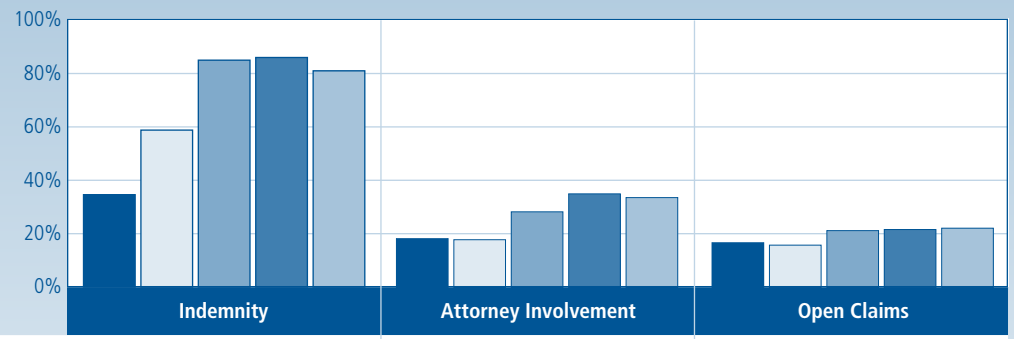
Case-mix adjusted likelihood estimates of attorney involvement ranged from less than 18 percent among claims with no opioid prescriptions to more than 45 percent among claims with 4 to 7 opioid prescriptions. Case-mix adjusted likelihood estimates of open status showed that for claims with two or more opioid prescriptions the likelihood that the claim was still open was incrementally higher as the number of opioid prescriptions increased.

Exhibit 11: Likelihood of Indemnity, Attorney Involvement and Open Status by Opiate Prescription Category



	Indemnity	Attorney Involvement	Open Claims
No Opioid Prescriptions	34.2%	17.8%	16.6%
1 Opioid Prescription	56.4%	21.5%	14.5%
2 – 3 Opioid Prescriptions	86.3%	32.7%	18.4%
4 – 7 Opioid Prescriptions	89.7%	45.0%	22.2%
> 7 Opioid Prescriptions	94.0%	36.2%	25.5%

Exhibit 12: Likelihood of Indemnity, Attorney Involvement and Open Status by Morphine Equivalent Category



	Indemnity	Attorney Involvement	Open Claims
No Morphine Equivalents	34.6%	18.2%	16.6%
Level 1*	58.8%	17.8%	15.7%
Level 2	85.0%	28.2%	21.1%
Level 3	86.0%	34.9%	21.5%
Level 4	81.0%	33.5%	22.0%

* There are no statistically significant differences between Level 1 Attorney Involvement and Open Claims status values and the baseline values.

Exhibit 12 shows case-mix-adjusted likelihood estimates of indemnity payments, attorney involvement and open status for each of the morphine equivalent categories. The likelihood of indemnity costs when there were no morphine equivalent milligrams was just under 35 percent. When there were up to 240 morphine equivalent milligrams (Level 1), the likelihood of indemnity increased to nearly 59 percent. Beyond that, the likelihood of indemnity was relatively stable, ranging between 81 percent of the Level 4 claims (more than 2,100 morphine equivalent milligrams) and 86 percent of the Level 3 claims (those with between 650 and 2,100 morphine equivalent milligrams).

Case-mix adjusted likelihood estimates of attorney involvement (litigation) ranged from 18 percent among claims with no morphine equivalent milligrams to more than one-third of the Level 3 and Level 4 claims (more than 650 morphine equivalent milligrams). Case-mix adjusted estimates of the likelihood of open status ranged from just under one out of six of the claims with less than 240 morphine equivalent milligrams (Level 1 or no MEs) to 22 percent among claims with more than 2,100 morphine equivalent milligrams (Level 4).

Discussion

In our study sample, one in four workers with a workers' compensation claim for a back condition with no spinal cord involvement received at least one prescription for opioid analgesics. Claimants who received these medications averaged 5.2 opioid prescriptions over the course of their treatment, including nearly 2,300 morphine equivalent milligrams.

This study found that injured workers with these types of back conditions who received modest levels of opioids (one prescription, or less than 240 morphine equivalent milligrams) had outcomes that were statistically similar to those who received no opioids. However, greater numbers of opioid prescriptions and morphine equivalent milligrams were associated with higher costs and a higher prevalence of other adverse outcomes, such as lost time from work and a longer duration of paid temporary disability. Claims with seven or more opioid prescriptions were three times more expensive on average than those with zero or one opioid prescription, and these workers were 2.7 times more likely to be off work, with an average of 4.7 times as many days off work. These results are consistent with recent findings linking a high incidence of opioid use with a greater number of lost-time days for occupational low back pain (Webster et al 2007).[10]

Physical activity is an important contributor to recovery among patients with disabling back conditions. It is a

10 For additional background on side effects and risks see Appendix C.

truism that, "You don't get injured workers well to get them back to work – you get them back to work to get them well."[11] Hilde found no evidence that staying active is harmful for either acute low back pain or sciatica, and noted the potentially harmful effects of prolonged bed rest (Hilde et al, 2003). For this reason, factors inhibiting physical activity will inhibit recovery. While pain reduction has been assumed to be the most direct route to enhancing activity levels among patients with back conditions, the literature regarding the use of opioids in the management of CNMP does not indicate that they consistently and reliably relieve pain. Indeed, the persistent use of opioids correlates with a decrease rather than an increase in the quality of life and functional status, especially over the long run, and when opioids are compared to active, non-opioid alternatives. Furthermore, Linton reported that there was no significant correlation between self-reported pain intensity and decreased activity levels, as measured by self-monitoring or observed behavior in a test situation (Linton 1985). This was confirmed by Al-Obaidi, who found that limitations in physical capacity are not explained solely by sensory perceptions of pain, but that anticipation of pain and fear/avoidance about physical activities were strong predictors of variations in physical performance (Al-Obaidi et al 2000).

One of this study's primary strengths is the use of a large database of 166,336 workers' compensation claims for back conditions. The availability of detailed diagnosis and medical treatment data, in addition to demographic data and injury characteristics, enabled the researchers to select a homogeneous sample of claims reflecting back conditions not involving the spinal cord, as well as to case mix adjust the analyses at an even finer level using ICD-9 codes. However, the analyses were subject to the limitations inherent in administrative data. Data on the psychosocial factors associated with pain and pain management, pre-injury health status, post-injury patient satisfaction and quality of life, the relationship of the patient to the treating physician and the patient's inclination to participate actively in his/her recovery, although generally not available, would add tremendous insight.

Public Policy Implications

Between 1992 and 2003, the California workers' compensation system experienced unprecedented cost increases for medical care delivered to injured workers. California Workers' Compensation Insurance Rating Bureau (WCIRB) estimates released in 2003 showed that between 1992 and 2002, the average ultimate medical cost[12] per workers' compensation indemnity claim increased from $8,693 to $31,767, a 265 percent increase (WCIRB 2003). Legislative reforms were enacted in 2003 and 2004 to control workers' compensation unit prices for medical services as well as utilization. The reforms mandated the adoption of an evidence-based Medical Treatment Utilization Schedule (MTUS) to define treatment reasonably required to cure or relieve an injured worker from the effects of an injury.

The initial version of the MTUS, created in June 2007, gave significant legal weight to treatment provided in accordance with the American College of Occupational and Environmental Medicine's Occupational Medicine Practice Guidelines, 2nd Edition for all conditions or injuries addressed by those guidelines, except for acupuncture services for which specific utilization rules are included in the regulation (Glass et al, 2004). For other conditions or injuries, the MTUS required treatment in accordance with other scientifically and evidence-based medical treatment guidelines nationally recognized by the medical community using ACOEM's strength-of-evidence rating methodology to evaluate and compare scientific evidence published in peer-reviewed, nationally recognized journals.

In August, 2007, the DWC solicited informal comment on draft chronic pain guidelines that it proposed to adopt in revisions to the MTUS. These guidelines will ultimately include recommendations on the use of opioids and other drugs. Pain management remains a significant topic of debate. Despite the high prevalence of opioids in the management of pain, the ACOEM guidelines state that opioid use is "the most important factor impeding recovery of function in patients referred to pain clinics," which "may reflect failure of providers to set up the expectation of improved function as a [prerequisite] for prescribing them."

11 Elizabeth Genovese, Key note address, 2007 California Workers' Compensation Institute Annual Meeting, San Francisco, CA.

12 Estimated ultimate costs relate to the projected future total benefit claim cost.

Conclusion

Bandura defined "self-efficacy" as an individual's convictions about his/her ability and capacity to achieve specific results. People with high levels of confidence in their own capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided (Bandura 1998). Woby studied the relationship between cognitive factors and levels of pain and disability in chronic low back pain patients and found that there was a strong, indirect association between functional self-efficacy and both pain intensity and degree of disability (Woby 2007). To the extent that using pain medication to address chronic pain shifts responsibility for recovery from the individual to the drug itself, the use of opioids beyond the acute stage of pain may decrease the injured worker's self-efficacy and sense of responsibility for his/her own recovery, leading to behavior that is antithetical to rapid recovery. The preponderance of evidence suggests that through its adverse impact on both activity levels and on self-efficacy, prolonged administration of pain medication impedes, rather than facilitates, injured workers' recovery from occupational back conditions.

References

Al-Obaidi SM, Nelson RM, Al-Awadhi S, Al-Shuwaie N, The role of anticipation and fear of pain in the persistence of avoidance behavior in patients with chronic low back pain., Spine 25: 9, 1126-31, May 1, 2000.

American Pain Society. Principles of Analgesic Use in the Treatment of Acute Pain and Cancer Pain, 4th Edition Chicago. 1999

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998)

Deshpande A, Furlan A, Mailis-Gagnon A, Atlas S, Turk D. Opioids for chronic low-back pain. Cochrane Database of Systematic Reviews 2007, Issue 3. Art. No.: CD004959. DOI: 10.1002/14651858. CD004959.pub3.

Eriksen, J., Sjogren, P., Bruera, E., Ekholm, O., Rasmussen, NK. "Critical issues on opioids in chronic non-cancer pain: an epidemiological study." Pain 125(1-2): 172-9. 2006.

Glass LS, Blais BR, Genovese E, Goertz MN, Harris JS, Hoffman HE et al. Occupational Medicine Practice Guidelines: Evaluation and Management of Common Health Problems and Functional Recovery of Workers (2nd Edition). Beverly Farms, MA: OEM Press, 2004, 1997.

Hilde, G., Hagen, K. B., Jamtvedt, G. and Winnem, M.; "Advice to stay active as a single treatment for low back pain and sciatica"; Cochrane Database Syst Rev 2002.

Ireland, J. ICIS Injury Scorecard Series #1: Medical Back Problems without Spinal Cord Involvement. CWCI. March 2007

Joranson DE, Ryan KM, Gilson AM, Dahl JL. Trends in medical use and abuse of opioid analgesics. JAMA.;283(13):1710-1714 April 5, 2000

Journal of the American Medical Association, Patient Page, Vol. 299 No. 1, January 2, 2008

The Lewin Group, Dobson/DaVanzo, KNG Consulting. Adapting the RBRVS Methodology to the California Workers' Compensation Physician Fee Schedule Prepared for: California Division of Workers' Compensation. May 5, 2008

Linton, S. J. The relationship between activity and chronic back pain; Pain; 21, 3, 289-94; 1985.

Martell BA, O'Connor PG, Kerns RD, et al. Systematic review: opioid treatment for chronic back pain: prevalence, efficacy, and association with addiction. Ann Intern Med. Jan 16 2007;146(2):116-127.

McNicol E, Carr DB. Pharmacologic Treatment of Pain. In McCarberg B, Passik SD. Expert Guide to Pain Management. Philadelphia: American College of Physicians, p.145-178. 2005.

Webster, B., Verma, S., Gatchel, R. Relationship Between Early Opioid Prescribing for Acute Occupational Low Back Pain and Disability Duration, Medical Cost, Subsequent Surgery and Late Opioid Use. Spine Volume 32, Number 19, pp 2127-2137. September, 2007

WCIRB Estimated Ultimate Medical Costs for Indemnity Claims as of Sept 2002; released March 2003.

Woby, S. R., Roach, N. K., Urmston, M. and Watson, P. J.; "The relation between cognitive factors and levels of pain and disability in chronic low back pain patients presenting for physiotherapy"; Eur J Pain. 2007.

Appendix A – ICD-9-CM Diagnosis Codes Associated with the "Medical Back Problems without Spinal Cord Injury" Diagnosis Category

Drug Category	Generic Equivalent	Common Trade Name	% of Total Med Back Scripts
NSAID	Bextra	Valdecoxib	0.7%
	Cataflam	Diclofenec Potassium Diclofenec Sodium	0.0% 0.9%
	Celebrex	Celecoxib	2.0%
	Clinoril	Sulindac	0.0%
	Daypro	Oxaprozin	0.3%
	Diclofenec	Diclofenec Potassium	0.0%
	Dolobid	Difunisal	0.0%
	Feldene	Piroxicam	1.6%
	Lodine	Etodolac	1.2%
	Meclomen	Meclofenamate	0.0%
	Mobic	Meloxicam	0.2%
	Motrin	Ibuprofen	9.6%
	Nalfon	Fenoprofen	0.0%
	Naprosyn	Naproxen	7.5%
	Ocufen	Flurbiprofen Sodium	0.0%
	Orudis	Ketoprofen	0.3%
	Relafen	Nabumetone	0.7%
	Tolectin	Tolmetin	0.0%
	Toradol	Ketorolac	0.6%
	Vioxx	Rofecoxib	0.1%
	Other	Other	1.0%
NSAID Total			**26.7%**
Muscle Relaxant	Flexeril	Cyclobenzaprine	5.5%
	Norflex	Orphenadrine	0.1%
	Parafon Forte	Chlorzoxazone	0.2%
	Robaxin	Methocarbamol	1.3%
	Skelaxin	Metaxalone	1.2%
	Soma	Carisoprodol	10.8%
	Zanaflex	Tizanidine	0.6%
	Other	Other	0.1%
Muscle Relaxant Total			**19.8%**

Drug Category	Generic Equivalent	Common Trade Name	% of Total Med Back Scripts
Opiate Agonist ME	Acetaminophen w/ Codeine	Tylenol w/ Codeine	1.8%
	Actiq	Fentanyl	0.0%
	Avinza	Morphine	0.2%
	Codeine	Codeine	0.0%
	Demerol	Meperidine	0.0%
	Dilaudid	Hydromorphone	0.0%
	Levo-Dromoran	Levorphanol	0.0%
	Methadone	Methadone	0.1%
	Oxycontin	Oxycodone	0.2%
	Percocet	Oxycodone w/ Acetaminophen	0.2%
	Percodan	Oxycodone/ASA	0.0%
	Sublimaze	Fentanyl	0.2%
	Tylenol w/ Codeine	Acetaminophen w/ Codeine	0.0%
	Vicodin	Hydrocodone	15.2%
	Other	Other	0.4%
Opiate Agonist ME Total			**18.3%**
Opiate Agonist	Avinza	Morphine	0.0%
	Belladonna Phenobarb	Belladonna Alkaloids-Opium	0.0%
	Butalbital	Butalbital	0.0%
	Darvocet	Propoxyphene and Acetaminophen	4.2%
	Darvon	Propoxyphene Hydrochloride	0.1%
	Demerol	Meperidine	0.0%
	Ultracet	Tramadol w Acetaminophen	0.7%
	Ultram	Tramadol	2.9%
	Other	Other	0.1%
Opiate Agonist Total			**8.0%**
Acid Suppressants	Nexium	Esomeprazole Magnesium	0.1%
	Pepcid	Famotidine	0.1%
	Prevacid	Lansoprazole	0.2%
	Prilosec	Omeprazole	0.2%
	Tagamet	Cimetidine	0.2%
	Zantac	Ranitidine HCL	5.2%
	other	Other	0.0%
Acid Suppressants Total			**6.0%**

Drug Category	Generic Equivalent	Common Trade Name	% of Total Med Back Scripts
Anti-Depressant	Aventyl	Nortriptyline	0.3%
	Cymbalta	Duloxetine HCL	0.1%
	Desyrel	Trazodone	0.5%
	Effexor	Venlafaxine HCL	0.2%
	Elavil	Amitriptyline	0.8%
	Halcion	Triazolam	0.2%
	Lexapro	Ecsitalopram	0.2%
	Paxil	Paroxetine HCL	0.2%
	Prozac	Fluoxetine HCL	0.3%
	Zoloft	Sertraline	0.1%
	Zyban	Bupropion HCL	0.2%
	Other	Other	0.1%
Anti-Depressant Total			**3.2%**
Anti-Anxiety	Ativan	Lorazepam	0.2%
	BuSpar	Buspirone	0.1%
	Klonopin	Clonazepam	0.2%
	Valium	Diazepam	0.8%
	Xanax	Alprazolam	0.4%
	Other	Other	0.1%
Anti-Anxiety Total			1.8%
Pain Relief Ointment	Analgesic Balm	Menthol	0.3%
	Banalg Liniment	Menthol	1.2%
	Kenalog	Triamcinolone	0.2%
	Other	Other	0.0%
Pain Relief Ointment Total			**1.7%**
Sleep Medication	Ambien	Zolpidem Tartrate	0.8%
	Dalmane	Flurazepam	0.2%
	Lunesta	Eszopiclone	0.0%
	Restoril	Temazepam	0.5%
	Other	Other	0.0%
Sleep Medication Total			**1.6%**
Anti-Convulsant	Lioresal	Baclofen	0.2%
	Neurontin	Gabapentin	1.0%
	ProSom	Estazolam	0.0%
	Topamax	Topiramate	0.2%
	Other	Other	0.0%
Anti-Convulsant Total			**1.4%**
Non-Narcotic Analgesic	Aspirin	Acetylsalicylic Acid	0.0%
	capsaicin	Capsaicin	0.0%
	choline magnesium	choline magnesium	0.0%
	Disalcid	Salsalate	0.0%

Drug Category	Generic Equivalent	Common Trade Name	% of Total Med Back Scripts
Non-Narcotic Analgesic (Continued)	Fioricet	Acetaminophen/ Butalbital/Caffeine	0.1%
	Tylenol	Acetaminophen	0.9%
	Other	Other	0.0%
Non-Narcotic Analgesic Total			**1.1%**
Steroid	Depo Medrol	Methylprednisolone	0.1%
	Dexacort	Dexamethasone	0.2%
	Medrol	Methylprednisolone	0.5%
	Prednisone	Prednisolone	0.1%
	Other	Other	0.1%
Steroid Total			**1.0%**
Local Anesthetic	Marcaine	Bupivacaine	0.1%
	Xylocaine	Lidocaine	0.8%
	Other	Other	0.0%
Local Anesthetic Total			**1.0%**
Nutritional Supplement	Cosamin	glucosamine/ chondroitin sulfate	0.1%
	Glucosamine	Glucosamine	0.6%
	Other	Other	0.0%
Nutritional Supplement Total			**0.6%**
Antibiotic	Keflex	Cephalexin	0.2%
	Other	Other	0.0%
Antibiotic Total			**0.3%**
Laxative	Colace	Docusate Sodium	0.1%
	Other	Other	0.0%
Laxative Total			**0.1%**
Antihistamine	Atarax	Hydroxyzine	0.1%
	Other	Other	0.0%
Antihistamine Total			**0.1%**
Alpha Agonist	Catapres	Clonidine HCL	0.0%
	Other	Other	0.0%
Alpha Agonist Total			**0.0%**
Opiate Partial Agonists	Nubain	Nalbuphine	0.0%
	Pentazocine	Pentazocine w Naloxone	0.0%
	Stadol	Butorphanol	0.0%
	Talacen	Pentazocine w Acetaminophen	0.0%
	Other	Other	0.0%
Opiate Partial Agonists Total			**0.0%**
Not Classified	Other	Other	7.2%
Not Classified Total			**7.2%**
Grand Total			**100.0%**

Appendix B – Equianalgesic Doses Table

Opioid	Equianalgesic Dose
Morphine	30
Codeine	200
Fentanyl[14]	0.1
Hydrocodone/APAP (Vicodin)	30
Hydromorphone (Dilaudid)	7.5
Levorphanol (Levo-Dromoran)	1.0
Meperidine (Demerol)	300
Methadone[15]	3
Oxycodone (Endocet, Oxycontin)	20

Appendix C—Literature Review: Side Effects and Risks of Opioid Use

Opioid use is often accompanied by adverse effects such as constipation, nausea and central nervous system depression (Veenema 2000), although many of these decrease over time. Use of sustained release opioids has also been shown to induce hypogonadism and decreases in DHEA-S in both men and women, with the decrease reflective of opioid effects both centrally (hypothalamic and pituitary) and peripherally (at the level of the testes, ovaries, and adrenals (Daniel 2002, 2006, 2008).

Symptoms associated with hypogonadism include fatigue, depression, diminished libido, impaired sexual function and osteoporosis. The literature on these topics is not developed to a point that allows definitive conclusions, but opioid-induced hypogonadism may be one of the factors that account for the lack of functional benefit seen in association with their use. Other sequelae of protracted use such as opioid-induced hyperalgesia may also play a role in diminishing any potential long-term functional benefit from opioid use (Ballantyne 2007).

This is particularly so if one considers evidence that patients with chronic disabling back pain who have post-injury opioid dependence have been shown to be 1.8 times more likely than patients without post-injury opioid dependence to have had pre-injury alcohol and drug dependence respectively (Dersh, 2007). Another recent cross sectional study involving 1,009 patients on chronic opioids for non-malignant pain described an elevated risk of opioid use for chronic pain among patients with a history of either physical or sexual abuse (Balousek 2007).

Patients with higher psychological disorder profiles have also been shown to have much lower probabilities of being employed (Jensen 2006) than those that do not. While the available literature does not address the critical question as to whether these associations are causal, a lifetime history of any substance abuse or psychological disorder/disturbance does seem to be associated with a lower rate of successful return to work and should markedly increase the concern the healthcare provider has for potential aberrant medication use, addiction, or abuse (Martell 2007; Breckenridge et al 2003, Wasan 2005)

Appendix C References

Ballantyne, J. C. (2007). "Opioid analgesia: perspectives on right use and utility." Pain Physician 10(3): 479-91.

Balousek, S., M. B. Plane, et al. (2007). "Prevalence of interpersonal abuse in primary care patients prescribed opioids for chronic pain." J Gen Intern Med 22(9): 1268-73; 2007

Breckenridge J, Clark JD. Patient characteristics associated with opioid versus nonsteroidal anti-inflammatory drug management of chronic low back pain. J Pain. 4(6):344-50; 2003

Daniell, H. W. (2002)."Narcotic-induced hypogonadism during therapy for heroin addiction." J Addict Dis 21(4): 47-53.; Daniell, H. W. (2002). "Hypogonadism in men consuming sustained-action oral opioids." J Pain 3(5): 377-84; 2003

Daniell, H. W. (2006). "DHEAS deficiency during consumption of sustained-action prescribed opioids: evidence for opioid-induced inhibition of adrenal androgen production." J Pain 7(12): 901-7; 2006

Daniell, H. W. (2008). "Opioid endocrinopathy in women consuming prescribed sustained-action opioids for control of nonmalignant pain." J Pain 9(1): 28-36.

Jensen MK, Thomsen AB, Højsted J. 10-year follow-up of chronic non-malignant pain patients: opioid use, health related quality of life and health care utilization. Eur J Pain. 2006;10(5):423-33; 2006

Martell BA, O'Connor PG, Kerns RD, et al. Systematic review: opioid treatment for chronic back pain: prevalence, efficacy, and association with addiction. Ann Intern Med. 146(2):116-27; 2007

Veenema KR, Leahey N, Schneider S. Ketorolac versus meperidine: ED treatment of severe musculoskeletal low back pain. Am J Emerg Med;18(4):404-7.) 2000,

Wasan AD, Davar G, Jamison R. The association between negative affect and opioid analgesia in patients with discogenic low back pain. Pain. 2005, 117(3):450-61).

14 90 mg morphine/24hr - 25 mcg/hr transdermal fentanyl. Duragesic Prescribing Information, Jannsen 2001.

15 The conversion guidelines state a range of 2 – 4, depending on patient conditions and other factors. Due to data limitations on patient characteristics and other clinical factors, a conversion factor of 3 was used in the methadone ME calculation .

About CWCI

The California Workers' Compensation Institute, incorporated in 1964, is a private, non-profit organization of insurers and self-insured employers conducting and communicating research and analyses to improve the California workers' compensation system.