Patient Characteristics Associated With Opioid Versus Nonsteroidal Anti-inflammatory Drug Management of Chronic Low Back Pain

James Breckenridge* and J. David Clark*,†

Abstract: Chronic low back pain is both prevalent and costly in many industrialized nations. Although many modalities exist for the treatment of this condition, few are as commonly used or as controversial as the use of opioids. Many sets of guidelines exist for the prescription of opioids for chronic nonmalignant pain, but little evidence addresses what factors actually contribute to the decision to initiate and maintain patients on these drugs. In these studies we first identified 2 groups of 100 patients each, all with chronic low back pain. Group N patients received long-term nonsteroidal anti-inflammatory drug therapy for the treatment of their pain, whereas Group O received opioids long-term. The identities of the specific analgesics were tabulated. A list of variables including patient characteristics, healthcare utilization factors, and psychologic characteristics were extracted from their medical records. Regression analysis was performed, which resulted in the identification of 4 variables of age, depression, personality disorder, and history of substance abuse as being closely linked to the use of opioids for the treatment of back pain in preference to nonsteroidal anti-inflammatory drugs alone. By using the derived regression equation, 79% of patients could be correctly classified into Group O or Group N. Pain intensity did not predict opioid use. We present alternative explanations for these observations.

Key words: Low back pain, chronic pain, opioids, depression, substance abuse, nonsteroidal anti-inflammatory drugs.

Opioids are perhaps the single most useful class of analgesic agents for pain of all types. Abundant evidence supports their use as the mainstay of therapy for moderate and severe pain of acute etiologies and caused by malignancies. Widely published well-validated guidelines are available outlining care by using opioids in these situations.[3,18,19,26,27] Although not commonly recognized, the vast majority of anesthetics involve the use of 1 or more opioids to provide the analgesic component of anesthesia. The use of opioids for chronic nonmalignant pain is also widely practiced but is still controversial. Some of the main controversies surround the unresolved issues of efficacy, abuse, dependence, tolerance, and hyperalgesia. At this point many short-term studies have been published demonstrating the efficacy of these agents in the management of chronic pain, but only a few long-term (more than 1 year) prospective studies exist.[16,20,21] No long-term study unequivocally demonstrated benefit, and the reported benefits were generally modest.

Although the prescription of opioids for the management of chronic nonmalignant pain is second only to nonsteroidal anti-inflammatory drugs (NSAIDS),[4] it is not clear what factors actually lead providers to initiate and maintain opioid therapy. Published guidelines for patient selection are not based entirely on empirical data; it is not clear whether specific groups of patients with chronic nonmalignant pain are particularly likely or unlikely to benefit from opioid therapy. These guidelines generally suggest that opioids be considered when alternative treatment attempts fail, but they also suggest that caution be used in providing opioids to patients with histories of psychiatric disease or substance abuse.[17,24,28] In the available long-term outcome studies, patients with histories of significant psychiatric disease and substance abuse were excluded.[16,20,21]

Two recent studies have examined some characteristics of patients with low back pain who receive opioids versus patients who do not receive opioids. In a study by Fanciullo et al,[6] more than 25,000 patients with back pain completed a health status survey. Analysis of the data indicated that patients using opioids were more likely to be unemployed, use tobacco, and have higher bodily pain scores on a SF-36 subscale. Another study suggested that patients with back pain had similar pain scores whether or not they used opioids, but they had

Received February 14, 2003; Revised March 31, 2003; Accepted April 16, 2003.

From the *Veterans Affairs Palo Alto Health Care System and †Stanford University Department of Anesthesiology, Palo Alto, California.

Address reprint requests to J. David Clark, MD, VAPAHCS, Anesthesiology, 112A, 3801 Miranda Ave, Palo Alto, CA 94304. E-mail: djclark@stanford.edu

1526-5900/2003 $30.00 + 0
doi:10.1016/S1526-5900(03)00638-2

more affective distress and self-reported disability than patients who did not use opioids.[7] The duration of analgesic use was unclear in both these studies. Finally, Turk and Okifuji[25] reported that patient pain behaviors were closely correlated with opioid prescribing, whereas pain severity again was not found to influence physician's prescribing decisions.[25] The present study attempted to identify which of several types of patient characteristics easily derived from patient's medical records were most closely linked to selecting them for treatment of chronic low back pain with opioids versus NSAIDS. Our focus was on healthcare utilization and psychiatric characteristics of these groups treated long-term with analgesics.

Methods

The study design was reviewed and approved by the Institutional Review Boards of Stanford University and the Veterans Affairs Palo Alto Health Care System (VAPAHCS). VAPAHCS consists of a university-affiliated tertiary referral hospital, 2 long-term inpatient facilities, and a group of primary and specialty clinics located in 9 northern California cities. Approximately 50,000 patients are served by VAPAHCS. A common computerized record keeping system (CPRS) links these sites and the associated VA pharmacies as well. All VAPAHCS outpatient notes written or dictated by general or specialty providers were available for review by using this system. Electronic problem lists, compensation information, lists of imaging studies, clinic pain scores, vital signs, pharmacy information, and the other data tabulated were available from all records included in this study.

Patient Selection

Patient records were identified electronically, which listed International Classification of Disease–ninth revision (ICD-9) codes commonly associated with back pain as primary diagnoses for at least 1 clinic visit in the 6-month surveillance period from August 1, 2001 to February 1, 2002. The included ICD-9 codes were 724.5 backache, 724.2 lumbago, 722.83 postlaminectomy syndrome, 724.4 lumbosacral neuritis, 721.3 lumbosacral spondylosis without myelopathy, 722.10 displacement of lumbar disk, 722.52 degeneration of lumbar or lumbosacral disk, and 724.02 lumbar spinal stenosis. From this group, 2 groups of patients were derived. The first group had been issued an NSAID but not an opioid from the VA pharmacy at least once during the 6-month surveillance (2150 patients); the second group had been given an opioid with or without having been given an NSAID at least once during that 6-month period (4325 patients).

From these groups 2 lists were constructed that included all patients with back pain related diagnoses who were issued either an NSAID prescription at least once per month for at least 5 of the 6 months of the surveillance period or an opioid prescription at least once per month for 5 of the 6 months with or without an NSAID issued 1 or more times. No other exclusion criteria were applied. From this point randomly chosen records from patients in each group were reviewed to determine whether patients were receiving the analgesics for chronic back pain (more than 3months' duration). Two groups of 100 patients each were thus constructed, one in which patients were receiving long-term NSAID therapy for chronic low back pain (Group N) and one group in which patients were receiving long-term opioids with or without NSAIDS for back pain (Group O).

Chart Review

All charts were then reviewed to collect and tabulate the demographic, medical, and psychologic information presented in the results section. All data on drug use were available in the pharmacy records. Prescriptions issued at VAPAHCS are virtually always filled at our own pharmacy because of the on-site location and the availability of the drugs at no cost or for a nominal co-payment ($7 US). All opioid doses were converted to oral morphine equivalents by using standard tables. All demographic information and VA certified disability ratings were readily available. The number of outpatient clinical encounters and the identities of the involved clinics were tabulated. The electronic active problem lists and clinic notes were reviewed for diagnoses. Thus medical and psychiatric diagnoses were physician assigned. Verbal pain scores on a 0 to 10 scale and vital signs were available for most (more than 85%) clinic visits. These pain scores were averaged for the 6-month surveillance period during which patients averaged about 2 clinic visits per month in both groups. All imaging reports obtained through VAPAHCS for the preceding 3 years were available for review.

Statistical Analysis

Univariate descriptive comparisons of Group N and Group O were performed by using *t* testing or Fisher test. We then proceeded to a logistic regression analysis to estimate adjusted odds ratios associated with each independent or explanatory variable (ie, the patient characteristics, utilization factors, and psychiatric variables.) This multivariate analysis calculated the odds ratios of Group O membership for each variable adjusted for the contribution of the remaining independent variables. All statistical analyses were performed in STATA Version 7 (Stata Corp, College Station, Texas). Where appropriate, data are presented as the mean ± standard deviation.

Results

With the methods described above 2 medication groups of 100 patients each were assembled. The demographics of these 2 groups were similar with respect to the average age and gender (Table 1).The majority of the patients were male, which was consistent with the VA population from which they were drawn. The NSAID group, Group N, contained no members receiving an opioid at any point during the 6-month prescribing surveillance period. The opioid group, Group O, had 39 members receiving at least 1 prescription for an NSAID during this time period. However, the NSAID users in Group O had an average of 2.7 refills during the 6-month surveillance period, whereas those in Group N had an average of 5.8 refills, suggesting that NSAIDS were often an ad-

Table 1. Comparison of Patient Variables

Characteristic	Group N (100)	Group O (100)	P Value
Patient characteristics			
Age (y)	61.8 (11.7)	61.5 (13.0)	.88
Female	5%	6%	1.0
VA service connection <50*	20%	18%	.86
VA service connection >50*	35%	34%	1.0
Six-month average pain score	5.4 (1.5)	5.4 (1.7)	.95
Body mass index	30.7 (6.0)	29.7 (7.1)	.30
Utilization factors			
Average number encounters†	21.8 (17.4)	32.7 (21.5)	<.001
At least one lumbar image‡	62%	75%	.07
Two or more lumbar images‡	29%	36%	.37
Pain clinic user	3%	13%	.02
Psychology/psychiatry clinic user	30%	67%	<.001
Psychiatric factors			
Depression	20%	65%	<.001
Anxiety	23%	28%	.62
Personality disorder	1.0%	14%	<.001
Psychosis	3.0%	3.0%	1.32
Substance abuse disorder	13%	43%	<.001

NOTE: Values expressed as mean (standard deviation) or percent.
*The patient's VA disability rating between 0 and 100
†The number of outpatient clinic visits recorded during the preceding 12 months at a VAPAHCS facility.
‡The number of diagnostic lumbar imaging studies on file at VAPAHCS done in the preceding 3 years.

junctive therapy for patients managed with opioids. We were not able to detect use of over-the-counter NSAIDS in either group. The high prevalence of NSAID use in individuals treated with opioids for chronic pain is consistent with our previous observations.[4]

Review of the patients' charts was carried out with attention to collecting information from 1 of 3 categories (patient characteristics, utilization factors, and psychiatric factors) displayed in Table 1. In addition to the age and gender similarities between the 2 groups mentioned above, the groups had similar percentages of individuals receiving either less than or more than 50% "service connected" disability payments. The percentage of military service connected disability is assigned by the VA to medical or psychiatric conditions first manifested while the patient was a member of the armed services. By law, veterans with service connected disabilities rated 50% or more receive the highest priority for VA medical services. The average pain scores during the 6-month surveillance period were identical for the 2 groups. The body mass index, which was collected as a variable not expected to be related to NSAID or opioid use, was also similar for the 2 groups.

Several pharmacologic variables were examined (Tables 2 and 3). It was noted that the opioid doses in terms of average daily oral morphine equivalent were highly variable. Whereas the average was 45.9 ± 44.5mg, 55 of the 100 patients on opioids received the equivalent of 30 mg oral morphine or less per day. Only 8 patients received the equivalent of more than 100 mg/day morphine, and only 1 received more than 200 mg/day. The average dose was substantially less than average doses used in long-term outcome studies for opioids in arthritis and back pain.[16,20,21] Patients in both groups had a high average total number of active prescriptions (all medications), 14.3 ± 5.8 in Group O versus 12.0 ± 8.1 in Group N.

We next examined in more detail the types of analgesics prescribed. Table 2 shows both the total numbers and percentages of patients receiving various NSAIDS for each group. The proportion of patients using NSAID who received each of the specific NSAIDS was similar in both groups. With respect to opioids, short-acting opioids were prescribed in preference to long-acting drugs or preparations, which was again consistent with our pre-

Table 2. Comparison of NSAIDS Prescribed

NSAID	Group N (100 total), % Prescriptions (same as No.)	Group O (39 total), % Prescriptions (actual No.)
Ibuprofen	36	28 (11)
Naproxen	23	26 (10)
Celecoxib	12	15 (6)
Etodolac	11	5 (2)
Rofecoxib	4	5 (2)
Diclofenac	4	3 (1)
Piroxicam	4	3 (1)
Indomethacin	2	3 (1)
Sulindac	2	3 (1)
Aspirin	1	0 (0)
Nabumetone	1	3 (1)
Salsalate	0	8 (3)

vious findings.[4] Only 26 of 100 patients received a long-acting opioid (Table 3). Particularly popular were short-acting opioid/acetaminophen combinations including ones containing hydrocodone and codeine, together accounting for 64% of all prescriptions. A small minority, 7 of 100 patients, received a combination of a short- and long-acting opioid for the treatment of their back pain.

We next proceeded with comparisons of patient characteristics between medication Groups O and N. To account for multivariate effects, we performed a logistic regression analysis of group status (Group O versus Group N) on 16 independent variables representing the previously discussed patient characteristics. This analysis is summarized in Table 4. Taken together, these 16 patient characteristics were significantly associated with medication group status (chi-square (16) = 70.3, $P < .001$), and with the Hosmer-Lemeshow goodness-of-fit criterion,[12] the logistic regression equation fit the data well (chi-square (16) = 13.23, $P = .78$). With this equation, 79% of patients could be correctly classified into Group O or Group N, yielding a sensitivity and specificity of 76% and 81%, respectively.

As displayed in Table 4, the major patient-specific characteristics significantly differentiating Groups O and N were the presence of a diagnosis of depression, personality disorder, or substance abuse. Age appeared to play a lesser but significant role. The odds of belonging to the opioid group were 8 times higher for patients with depression and almost 5 times higher for patients with substance abuse disorders when adjusted for all other variables. Thus, the effects of depression and substance abuse could not be explained statistically by variations in demographics or other patient characteristics or by differences in utilization factors.

Table 3. Types of Opioids Prescribed

Opioid	Number of prescriptions*
Hydrocodone	51
Codeine	18
Oxycodone sustained acting	13
Oxycodone	10
Morphine sustained acting	7
Methadone	5
Fentanyl transdermal	1
Hydromorphone	1
Morphine	1
Propoxyphene	1

*Several patients were receiving 2 opioids simultaneously.

With regard to the large effect associated with the presence of personality disorders, it should be noted that only 1% of Group N compared with 14% of Group O had personality disorders, which resulted in the very large confidence interval shown in Table 4. A more precise future estimate of the effect of personality disorders will require a much larger patient sample.

Although patients in Group O had on average more encounters, more frequent lumbar imaging, and were also more likely to have used both pain clinic and mental health services (Table 1), these utilization factors did not reach statistical significance in the multivariate logistic regression analyses. Consequently, these differences can

Table 4. Comparison of Patient Variables

Characteristic	Adjusted Odds Ratio	Wald Test	P Value	95% Confidence Interval
Patient characteristics				
Age	1.03	2.12	<.03	1.00–1.07
Female	2.10	0.99	<.32	0.48–9.07
VA service connection <50%	0.80	−0.48	<.63	0.32–2.02
VA service connection >50%	0.88	−0.29	<.77	0.37–2.10
Six-month average pain score	0.92	−0.69	<.49	0.74–1.16
Body mass index	0.99	−0.27	<.79	0.94–1.05
Utilization factors				
Average number encounters	0.93	−0.18	<.86	0.42–2.05
At least one lumbar image	1.17	0.35	<.73	0.49–2.78
Two or more lumbar images	1.35	0.69	<.49	0.58–3.15
Pain clinic user	3.74	1.68	<.09	0.80–17.39
Psychology/psychiatry clinic user	0.70	−0.50	<.62	0.17–2.87
Psychiatric factors				
Depression	7.88	3.00	<.001	2.04–30.40
Anxiety	0.44	−1.62	<.11	0.16–1.19
Personality disorder	18.61	2.30	<.02	1.54–224.09
Psychosis	1.64	0.46	<.64	0.20–13.18
Substance abuse disorder	4.72	3.23	<.001	1.84–12.10

NOTE: N = 200, χ^2 (16) = 70.3 $p < .001$.
Hosmer-Lemeshow goodness-of-fit (χ^2 (16) = 13.23, $p = .78$).

be accounted for statistically by the distribution of psychiatric disorders observed among opioid and NSAID users.

We went on to repeat the analysis by comparing NSAID users to patients receiving opioids only (no NSAIDS, N = 61). In this analysis the results were very similar, with depression and history of substance abuse again highly significant ($P < .001$) and personality disorder and age trending toward significance ($P = .09$ and .06, respectively). No new factors were identified.

All 2- and 3-way interactions among patient variables were evaluated. None, however, approached statistical significance. We also investigated the predictive value of a patient's type of disability (psychiatric versus medical), but these characteristics were not predictive of opioid versus NSAID use.

Discussion

Although opioids are a mainstay of treatment for moderate and severe pain of many sorts, we currently possess only limited data supporting the general utility of these drugs in chronic pain states. Specifically, although many have expressed their opinions and even offered guidelines for the use of these drugs for chronic nonmalignant pain, these guidelines are not and in fact cannot at this point be based entirely on outcome data.[17,24] Indeed, structured pain management programs often report that patients can be tapered off of opioids with improvements in pain, mood, and functional status.[8,10] We have previously shown that the use of opioids is common in US veterans with chronic pain. In that population approximately 44% of those receiving a prescription analgesic for chronic pain received an opioid.[4] We might then ask what factors are associated with a provider's decision to initiate and maintain a patient on opioids. The results of this study are, of course, probably most useful for understanding prescribing habits for pain populations with similar characteristics. In particular, it should be recognized that the VA back pain population used was predominantly male, and that there is a relatively high prevalence of psychiatric disease and substance abuse in the VA population in general.

In this study we examined a number of demographic, physical, medical, and psychologic factors that could easily be extracted from an electronic record keeping system for a total of 200 US veterans with chronic back pain managed pharmacologically with either primarily NSAIDS or primarily opioids. Regression analysis identified relatively few factors linked to the use of opioids. We were particularly surprised to find a lack of correlation between the amount of disability or the types (physical versus psychologic) of disabilities the patients had and the use of opioid narcotics for pain. It should be recognized, however, that most of the patients were discharged from military service decades before the time this study was undertaken, and their more recent experiences with back pain might not alter the amount of disability compensation they receive related to their military service. We were not able to determine whether patients received state or other federal disability payments. In another recent study a similar lack of correlation between disability compensation and opioid use for low back pain was noted.[6] Also remarkable was the lack of difference in pain scores between the 2 groups of patients and the failure of the average pain score to predict opioid use. This result was similar to the results of Fillingim et al,[7] who failed to find a correlation between reported pain severity on a 0 to 10 scale and opioid use for back pain, and to the data of Turk and Okifuji,[25] who provided similar data for a mixed chronic pain population. One might hypothesize that the likelihood of prescribing an opioid would have a simple correlation with the intensity of pain that a patient was reporting. In fact, the use of simple 0 to 10 pain scales to compare pain intensity between groups of patients with chronic pain has been carefully validated.[13,14] This does not mean that pain scores are the only factors that providers do or should take into account, however. Providers seem to be influenced by factors unrelated to simple pain intensity when they prescribe opioids for back pain.

Of the factors examined, those having to do with psychiatric history were the most strongly associated with opioid use for low back pain. As can be seen in Table 4, depression, personality disorder, and a history of substance abuse were more strongly represented in the opioid group and were found in regression analysis to be the factors most strongly predictive of whether a patient was receiving an opioid for their back pain. It needs to be kept in mind that it was often unclear as to how rigorously some diagnoses, particularly the psychiatric diagnoses, were established. Increasing age as a factor reached statistical significance but had very little overall influence on the basis of the odds ratio (1.00 to 1.07).

There are various explanations for these observations. Some explanations involve the actual characteristics of the patients themselves as the primary determinants of analgesic prescribing; others involve the response that the prescribing physician might have to the characteristics of the patient in pain. Of course, it is the physician who ultimately determines which drug is prescribed. First, it might be that patients with histories of psychiatric disorders are simply much less likely to respond to alternative therapies for back pain. Indeed, evidence has been reported indicating that various psychologic conditions such as depression reduce the efficacy of invasive therapies in the management of chronic pain,[2,15,23] although it is not clear whether the same applies to pharmacologic therapies. Patients in the opioid group might simply be ones who have failed management with alternative therapies or who did not tolerate drugs like NSAIDS. Although not determined in this study, it seems probable that at least some alternatives to opioids were tried before the initiation of long-term opioid therapy. In fact, 39% of patients on opioids in the present study remained on adjunctive NSAIDS as well, suggesting that neither class of analgesic alone was satisfactory. Thus finding that a patient is receiving an opioid might be a reflection of the failure of other treatments, ultimately resulting in the use of a treatment of "last resort."

Another factor that might impact the provider's decision making is the presentation of the patient. Patients with depression, substance abuse, and personality disorder might present in such a manner as to appear more in need of help, which might in turn lead to more aggressive therapy in the form of opioids. All of the identified factors were linked to poor coping skills.[1,5,9] It might be reasonable to suppose that a patient who seems to be coping poorly or is distressed will arouse more concern and sympathy in the provider than the well-adjusted patient with an identical pain score. Indeed, the display of pain behaviors was found to be strongly linked to the decision to prescribe opioids in a previous study,[25] and in the study of Fillingim et al,[7] patients using opioid were found to display more distress. Interestingly, depression does not seem to predict the likelihood of receiving back surgery for low back pain,[11] so we cannot necessarily extend these comments to all more aggressive forms of treatment for back pain.

A third possibility is that patients with depression, personality disorders, and a history of substance abuse are requesting and using opioids for purposes other than or in addition to pain relief. The pain management literature at this point generally fails to provide evidence for a strong causal link between the use of opioids for pain and overt addiction. Yet, there is a wide range of possible behaviors short of addiction that involves the use of opioids for purposes other than pain relief. Opioids elevate mood and reduce anxiety at least short-term, which, in addition to reducing pain, might make opioids more desirable than NSAIDS to individuals with certain psychiatric histories. In a study of individuals dependent on codeine versus nondependent, Sproule et al[22] found that the codeine users deemed to be dependent often used the opioid for pleasurable effects, relaxation, or to reduce withdrawal symptoms in addition to treating chronic pain. Thus we should not suppose that analgesia is the sole reason patients with chronic pain take opioids.

Finally, it should be recognized that this study in no way bears on the question of whether the use of opioids or NSAIDS is beneficial in the treatment of chronic low back pain. We have not attempted to evaluate outcome, although most patients in this study group filled their prescriptions for NSAIDS and opioids every month, perhaps indicating that they found taking their respective analgesics to be beneficial in some way. Given the paradox of a strong bias in the literature against the use of opioids for chronic pain patients with psychiatric and substance abuse histories and the observation that psychiatric and substance abuse diagnoses are the best predictors in this VA population of who is treated with opioids, it is clear that well-designed outcome studies are required to support or discourage this practice. We propose that for the time being, pain specialists or individuals with the ability and inclination to closely review psychiatric histories and follow outcomes should be involved when opioids are used for the management of chronic nonmalignant pain in psychiatric patients. Our previous work has suggested that although primary providers are the providers maintaining patients on opioids in more than 90% of cases in which opioids are used for the management of chronic pain, patient evaluation, follow-up, and documentation are often lacking.[4]

References

1. Agronin ME: Personality and psychopathology in late life. Geriatrics 53(Suppl 1):S35-40, 1998

2. Burchiel KJ, Anderson VC, Wilson BJ, Denison DB, Olson KA, Shatin D: Prognostic factors of spinal cord stimulation for chronic back and leg pain. Neurosurgery 36:1101-1111, 1995

3. Ad Hoc Committee on Cancer Pain of the American Society of Clinical Oncology: Cancer: cancer pain assessment and treatment curriculum guidelines. Support Care Cancer 1:67-73, 1993

4. Clark JD: Chronic pain prevalence and analgesic prescribing in a general medical population. J Pain Symptom Manage 23:131-137, 2002

5. Cole JD: Psychotherapy with the chronic pain patient using coping skills development: outcome study. J Occup Health Psychol 3:217-226, 1998

6. Fanciullo GJ, Ball PA, Girault G, Rose RJ, Hanscom B, Weinstein JN: An observational study on the prevalence and pattern of opioid use in 25,479 patients with spine and radicular pain. Spine 27:201-205, 2002

7. Fillingim RB, Doleys DM, Edwards RR, Lowery D: Clinical characteristics of chronic back pain as a function of gender and oral opioid use. Spine 28:143-150, 2003

8. Flor H, Fydrich T, Turk DC: Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. Pain 49:221-230, 1992

9. Goldberg JF, Singer TM, Garno JL: Suicidality and substance abuse in affective disorders. J Clin Psychiatry 62:35-43, 2001

10. Guzman J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, Bombardier C: Multidisciplinary rehabilitation for chronic low back pain: systematic review. BMJ 322:1511-1516, 2001

11. Hagg O, Fritzell P, Nordwall A: Characteristics of patients with chronic low back pain selected for surgery: a comparison with the general population reported from the Swedish lumbar spine study. Spine 27:1223-1231, 2002

12. Hosmer DW, Lemeshow S: Applied Logistic Regression. New York, NY, John Wiley and Sons, 1989

13. Jensen MP, Turner JA, Romano JM, Fisher LD: Comparative reliability and validity of chronic pain intensity measures. Pain 83:157-162, 1999

14. Jensen MP, Turner LR, Turner JA, Romano JM: The use of multiple-item scales for pain intensity measurement in chronic pain patients. Pain 67:35-40, 1996

15. Katz JN, Lipson SJ, Brick GW, Grobler LJ, Weinstein JN, Fossel AH, Lew RA, Liang MH: Clinical correlates of patient

satisfaction after laminectomy for degenerative lumbar spinal stenosis. Spine 20:1155-1160, 1995

16. Milligan K, Lanteri-Minet M, Borchert K, Helmers H, Donald R, Kress H-G, Adriaensen H, Moulin D, Jarvimaki V, Haazen L: Evaluation of long-term efficacy and safety of transdermal fentanyl in the treatment of chronic non-cancer pain. J Pain 2:197-204, 2001

17. Portenoy RK: Opioid therapy for chronic nonmalignant pain: a review of the critical issues. J Pain Symptom Manage 11:203-217, 1996

18. Ready BL, Ashburn M, Caplan R, Carr D, Connis R, Dixon C, Hubbard L, Rice LJ: Practicea. Practice guidelines for acute pain management in the perioperative setting—a report by the American Society of Anesthesiologists task force on pain management, acute pain section. Anesthesiology 82:1071-1081, 1995

19. Ferrante FM, Bedder M, Caplan R, Chang HM, Connis R, Harrison P, Jamison R, Krane EJ, Nedeljkovic S, Pratt R, Portenoy RK: Practicea. Practice guidelines for cancer pain management—a report by the American Society of Anesthesiologists task force on pain management, cancer pain section. Anesthesiology 84:1243-1257, 1996

20. Roth SH, Fleischmann RM, Burch FX, Dietz F, Bockow B, Rapoport RJ, Rutstein J, Lacouture PG: Around-the-clock, controlled-release oxycodone therapy for osteoarthritis-related pain: placebo-controlled trial and long-term evaluation. Arch Intern Med 160:853-860, 2000

21. Schofferman J: Long-term opioid analgesic therapy for severe refractory lumbar spine pain. Clin J Pain 15:136-140, 1999

22. Sproule BA, Busto UE, Somer G, Romach MK, Sellers EM: Characteristics of dependent and nondependent regular users of codeine. J Clin Psychopharmacol 19:367-372, 1999

23. Trief PM, Grant W, Fredrickson B: A prospective study of psychological predictors of lumbar surgery outcome. Spine 25:2616-2621, 2000

24. Turk DC: Clinicians' attitudes about prolonged use of opioids and the issue of patient heterogeneity. J Pain Symptom Manage 11:218-230, 1996

25. Turk DC, Okifuji A: What factors affect physicians' decisions to prescribe opioids for chronic noncancer pain patients? Clin J Pain 13:330-336, 1997

26. Ventafridda V, Tamburini M, Caraceni A, De Conno F, Naldi F: A validation study of the WHO method for cancer pain relief. Cancer 59:850-856, 1987

27. Zech DF, Grond S, Lynch J, Hertel D, Lehmann KA: Validation of World Health Organization guidelines for cancer pain relief: a 10-year prospective study. Pain 63:65-76, 1995

28. Ziegler DK: Opioids in headache treatment: is there a role? Neurol Clin 15:199-207, 1997