Narcotic Use and Postoperative Doctor Shopping in the Orthopaedic Trauma Population

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Background: The negative consequences of narcotic use and diversion for nonmedical use are on the rise. A growing number of narcotic abusers obtain narcotic prescriptions from multiple providers (''doctor shopping''). This study sought to determine the effects of multiple postoperative narcotic providers on the number of narcotic prescriptions, duration of narcotics, and morphine equivalent dose per day in the orthopaedic trauma population.

Methods: Our prospective cohort study used the state-controlled substance monitoring database to identify all narcotic prescriptions filled three months prior to admission and six months following discharge for enrolled patients. Patients were assigned into two groups: a single narcotic provider group with prescriptions only from the treating surgeon (or extenders) or a multiple narcotic provider group with prescriptions from both the treating surgeon and an additional provider or providers.

Results: Complete data were available for 130 of 151 eligible patients. Preoperative narcotic use, defined by three or more narcotic prescriptions within three months of admission, was noted in 8.5% of patients. Overall, 20.8% of patients sought multiple narcotic providers postoperatively. There were significant increases in postoperative narcotic prescriptions ($p < 0.001$) between the single narcotic provider group (two prescriptions) and the multiple narcotic provider group (seven prescriptions), in duration of postoperative narcotic use ($p < 0.001$) between the single narcotic provider group (twenty-eight days) and the multiple narcotic provider group (110 days), and in morphine equivalent dose per day ($p = 0.002$) between the single narcotic provider group (26 mg) and the multiple narcotic provider group (43 mg). Patients with a high school education or less were 3.2 times more likely to seek multiple providers ($p = 0.02$), and patients with a history of preoperative narcotic use were 4.5 times more likely to seek multiple providers ($p < 0.001$).

Conclusions: There is a 20.8% prevalence of postoperative doctor shopping in the orthopaedic trauma population. Patients with multiple postoperative narcotic providers had a significant increase in postoperative narcotic prescriptions, duration of narcotics, and morphine equivalent dose per day.

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The negative consequences of narcotic use and diversion of narcotics for nonmedical use in the United States are growing at dramatic rates[1-4]. Americans consume 80% of the global opioid supply and 99% of the global hydrocodone supply[5]. The alarming rise in unintentional overdose deaths in the United States, which increased 124% from 1999 to 2007, is largely due to increases in prescription narcotic overdoses[6-8]. Up to 20% of prescription drug abusers receive their narcotic supply from a single physician prescriber, while a growing percentage obtains narcotic prescriptions by seeking multiple providers ("doctor shopping")[9].

There is a paucity of information regarding narcotic use in the orthopaedic trauma patient population. Some work has focused on positive toxicology screening at the time of admission following orthopaedic trauma[10,11], but there is currently limited literature assessing the impact of postoperative doctor shopping

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TABLE I Differences in Patient Demographic and Clinical Characteristics by Patients Seeking Narcotics from a Single Narcotic Provider or Multiple Narcotic Providers

Characteristic	Total (N = 130)	Single Narcotic Provider Group (N = 103)	Multiple Narcotic Provider Group (N = 27)	P Value*
Age† *(yr)*	37.5 ± 13.4	36.9 ± 13.7	39.6 ± 12.2	0.37
Sex‡				0.89
Male	81 (62.3%)	64 (62.1%)	17 (63.0%)	
Female	49 (37.7%)	39 (37.9%)	10 (37.0%)	
Race‡				0.47
White	107 (82.3%)	83 (80.6%)	24 (88.9%)	
Non-white	23 (17.7%)	20 (19.4%)	3 (11.1%)	
Level of education‡				0.005
High school education or less	78 (60.0%)	55 (53.4%)	23 (85.2%)	
More than high school education	52 (40.0%)	48 (46.6%)	4 (14.8%)	
Insurance‡				0.11
Private	73 (56.2%)	62 (60.2%)	11 (40.7%)	
Public	16 (12.3%)	12 (11.7%)	4 (14.8%)	
None	41 (31.5%)	29 (28.2%)	12 (44.4%)	
Injury type‡				0.33
Lower extremity	99 (76.2%)	76 (73.8%)	23 (85.2%)	
Upper extremity	17 (13.1%)	15 (14.6%)	2 (7.4%)	
Pelvic or acetabular	14 (10.8%)	12 (11.7%)	2 (7.4%)	
Distance to hospital† *(mi)*	38.7 ± 43.7	37.3 ± 45.8	43.8 ± 35.3	0.09
Alcohol use‡				0.01
Yes	57 (43.9%)	39 (37.9%)	18 (66.7%)	
No	73 (56.2%)	64 (62.1%)	9 (33.3%)	
Tobacco use‡				0.18
Yes	67 (51.5%)	50 (48.5%)	17 (63.0%)	
No	63 (48.5%)	53 (51.5%)	10 (37.0%)	
Psychiatric history of depression, anxiety, attention deficit hyperactivity disorder, or bipolar disorder‡				0.72
Yes	28 (21.5%)	21 (20.4%)	7 (25.9%)	
No	102 (78.5%)	82 (79.6%)	20 (74.1%)	
Comorbid conditions‡				0.07
None	91 (70.0%)	76 (73.8%)	15 (55.6%)	
One or more	39 (30.0%)	27 (26.2%)	12 (44.4%)	
Preoperative narcotic use‡				<0.001
Yes	11 (8.5%)	2 (1.9%)	9 (33.3%)	
No	119 (91.5%)	101 (98.1%)	18 (66.7%)	

*Significance was set at $p < 0.05$. †The values are given as the mean and the standard deviation and continuous variables were compared with use of the Wilcoxon rank-sum test. ‡The values are given as the number of patients, with the percentage in parentheses, and dichotomous or categorical variables were compared with use of the chi-square or Fisher exact test.

and the role of the orthopaedic surgeon[12]. The purpose of this study was to identify the prevalence of patients with orthopaedic trauma seeking multiple providers for narcotics postoperatively and to determine the predictors of multiple providers in the orthopaedic trauma patient population. We hypothesized that preoperative narcotic use would be predictive of multiple providers, and patients seeking multiple providers would obtain more narcotic prescriptions, a longer duration of narcotics, and a greater morphine equivalent dose per day.

Materials and Methods

A prospective cohort study was conducted that included adult patients admitted to the inpatient orthopaedic trauma service at a single, high-volume, level-I trauma center from January 2011 to December 2011. Three hundred and

ninety consecutive patients were identified and were considered for inclusion. Eligible patients were between the ages of eighteen and sixty-five years; were English speaking; and had an isolated, operative orthopaedic injury requiring admission from the emergency department to the orthopaedic trauma service. Criteria for exclusion included: (1) patients with multiple traumatic injuries, including those with more than one extremity injured; (2) primary residence in a state other than the state of the treating institution; (3) postoperative complication requiring repeat operation; (4) incarceration; and (5) incomplete data in the controlled substance monitoring database. Institutional review board approval was obtained.

Our state's controlled substance monitoring database was used to identify all narcotic prescriptions filled three months prior to hospital admission and six months following discharge from the hospital. Controlled substance monitoring database data for all narcotic prescriptions filled in the state include the patient's name, date of birth, and sex; narcotic dosage and quantity; prescriber; and date that the prescription was filled.

Narcotic use was recorded as a time-varying covariate using an as-prescribed approach assuming that patients take all prescribed narcotics[6,13]. The daily narcotic dose for each patient was converted into a morphine equivalent dose using standard conversion factors[14,15]. Preoperative narcotic use was defined as three or more narcotic prescriptions filled within three months of admission[14]. The total duration of narcotics was based on the final narcotic prescription provided by the treating surgeon (or physician extenders).

Patients were assigned to one of two groups, the single narcotic provider group or the multiple narcotic provider group. The single narcotic provider group included patients who only received postoperative narcotic prescriptions from the treating surgeon or his or her residents, fellows, and/or nurse practitioners. The multiple narcotic provider (or doctor-shopping) group included patients who received postoperative narcotic prescriptions from an additional provider or providers while still receiving narcotics from the treating surgeon (or physician extenders).

Patient characteristics were abstracted from the electronic medical record. Data included age, sex, race, level of education, insurance, injury type, distance between the patient's home and the treating hospital in miles, alcohol use, tobacco use, psychiatric diagnosis (depression, anxiety, attention deficit-hyperactivity disorder, or bipolar disorder), comorbidities, and preoperative narcotic use.

Statistical Methods

Descriptive statistics were used to summarize all study variables (means, standard deviations, medians, interquartile range, and frequency). Continuous outcome variables of number of postoperative narcotic prescriptions, duration of postoperative narcotics, and morphine equivalent dose per day were examined for the assumptions required for parametric analyses. Wilcoxon rank-sum and chi-square or Fisher exact tests were used to compare demographic and clinical characteristics of patients receiving postoperative narcotics between those with a single narcotic provider and those with multiple narcotic providers. A multivariable log-binomial regression analysis examined the relation between risk factors and use of multiple narcotic providers. The log-binomial model was chosen to obtain relative risks for ease of interpretation. Calculation of relative risks allowed determination of how much risk is increased or is decreased for a specific risk factor. Also, the odds ratio will overstate the effect size when interpreted as a relative risk, especially when the outcome prevalence is high[16]. Thus, we chose a log-binomial model to achieve conservative estimates and to provide an interpretation that has clinical relevance.

Separate Wilcoxon rank-sum tests were used to assess the bivariate association between multiple narcotic providers and outcomes (i.e., number of postoperative narcotic prescriptions, duration of postoperative narcotics, and morphine equivalent dose per day). Robust multivariable linear regression analyses with bootstrapping were then used to determine the association between multiple providers and outcomes controlling for demographic and clinical variables. Stata statistical software (Version 11.0; StataCorp, College Station, Texas) was used to analyze the data. The level of significance was set at $p < 0.05$.

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No external funding was used for this investigation.

Results

From January 1 to December 31, 2011, 390 consecutive patients were assessed for eligibility and 180 patients were eligible. Complications requiring reoperation led to the exclusion of an additional twenty-nine patients, resulting in a total of 151 patients. Twenty-one patients had incomplete data for the controlled substance monitoring database without a clear record of narcotic prescriptions being filled in our state. In these instances, the lack of data for the controlled substance monitoring database was believed to be attributable to a name mismatch and discrepancy between the controlled substance monitoring database and the electronic medical record at our institution. Demographic and clinical characteristics for patients receiving narcotics exclusively from the treating surgeon (or physician extenders) were compared with patients receiving narcotics from multiple providers (Table I). Narcotic prescription data from three months prior to hospital admission through six months following hospital discharge were assessed, and the average length of clinical follow-up was 7.2 months.

Doctor shopping was noted in 20.8%, with twenty-seven of 130 patients receiving narcotic prescriptions from multiple providers while still receiving narcotic prescriptions from the treating surgeon. The average age (and standard deviation) of patients with multiple narcotic providers was 39.6 ± 12.2 years, and the patients were primarily white (89%), male (63%), and uninsured (44%) and had a high school education or less (85%). There were no differences between the single-provider and multiple-provider groups with regard to age, sex, race, injury type, distance between the patient's home and the treating hospital, tobacco use, psychiatric history (depression, anxiety, attention deficit hyperactivity disorder, or bipolar disorder), or comorbidities (Table I). No patients developed chronic regional pain syndrome and no patients required amputation. Six patients in the multiple-provider group and twelve patients in the single-provider group had open fractures. Significant differences ($p < 0.05$) were noted for education, alcohol use, and preoperative narcotic use. Multivariable log-binomial regression analysis for patients seeking multiple providers is noted in Table II. Education and preoperative narcotic use were significant

TABLE II Multivariable Log-Binomial Regression Analysis for the Multiple-Provider Group

Characteristic	Relative Risk*	P Value
Level of education: high school or less versus more than high school (reference)	3.2 (1.3 to 8.1)	0.02
Alcohol use: yes versus no (reference)	1.3 (0.84 to 1.9)	0.27
Preoperative narcotics: yes versus no (reference)	4.5 (2.9 to 7.0)	<0.001

*The values are given as the relative risk with the 95% CI in parentheses. The adjusted correlation coefficient is 0.25.

TABLE III Differences in Outcomes by Patients Seeking Narcotics from a Single Narcotic Provider or Multiple Narcotic Providers

Characteristic	Total* (N = 130)	Single Narcotic Provider Group* (N = 103)	Multiple Narcotic Provider Group* (N = 27)	P Value†
No. of prescriptions	3 (2 to 5)	2 (2 to 4)	7 (4 to 9)	<0.001
Duration of narcotics *(d)*	65.1 (28 to 118.3)	28 (28 to 112)	109.9 (77 to 142.8)	<0.001
Morphine equivalent dose per day *(mg)*	26.5 (16 to 43)	26 (16 to 40)	43 (21 to 65)	0.002

*The values are given as the median, with the interquartile range in parentheses. †Wilcoxon rank-sum tests were used to compare continuous variables. Significance was denoted by $p < 0.05$.

independent predictors of multiple narcotic providers, after controlling for alcohol use. Patients with a high school education or less were 3.2 times more likely (95% confidence interval [95% CI], 1.3 to 8.1 times; $p = 0.02$) to seek multiple providers, and patients with a history of preoperative narcotic use were 4.5 times more likely (95% CI, 2.9 to 7.0 times; $p < 0.001$) to seek multiple providers.

Differences in outcomes were compared between patients with a single provider and those with multiple providers (Table III). Patients receiving postoperative narcotics from multiple providers had significant differences when compared with patients receiving postoperative narcotics exclusively from the treating surgeon; there was a significant increase in postoperative narcotic prescriptions ($p < 0.001$) between the single-provider

TABLE IV Robust Multivariable Linear Regression Analysis with Bootstrapping for Number of Prescriptions, Duration of Narcotics in Days, and Morphine Equivalent Dose per Day

Characteristic	Regression Coefficient*	P Value
No. of prescriptions†		
Age in years	−0.04 (−0.07 to −0.01)	0.01
Race: non-white versus white (reference)	0.52 (−1.64 to 0.60)	0.36
Insurance: none versus private or public (reference)	0.77 (−0.15 to 1.7)	0.10
Provider: multiple versus single (reference)	3.0 (1.8 to 4.2)	<0.001
Level of education: high school or less versus more than high school (reference)	0.21 (−1.1 to 0.68)	0.65
Alcohol use: yes versus no (reference)	0.52 (−0.35 to 1.4)	0.24
Preoperative narcotics use: yes versus no (reference)	0.09 (−1.5 to 1.7)	0.91
Duration of narcotics in days‡		
Age in years	−0.02 (−0.81 to 0.77)	0.96
Race: non-white versus white (reference)	4.5 (−23.3 to 32.2)	0.75
Insurance: none versus private or public (reference)	6.9 (−15.8 to 29.6)	0.55
Provider: multiple versus single (reference)	34.5 (5.1 to 63.9)	0.02
Level of education: high school or less versus more than high school (reference)	7.9 (−14.0 to 29.8)	0.48
Alcohol use: yes versus no (reference)	13.7 (−7.8 to 35.2)	0.21
Preoperative narcotics use: yes versus no (reference)	18.7 (−21.8 to 59.2)	0.36
Morphine equivalent dose per day§		
Age in years	−0.44 (−0.68 to −0.20)	<0.001
Race: non-white versus white (reference)	4.9 (3.57 to 13.3)	0.26
Insurance: none versus private or public (reference)	3.9 (3.0 to 10.8)	0.27
Provider: multiple versus single (reference)	11.6 (2.7 to 20.6)	0.01
Level of education: high school or less versus more than high school (reference)	2.3 (−4.3 to 9.0)	0.49
Alcohol use: yes versus no (reference)	1.5 (−8.1 to 5.0)	0.65
Preoperative narcotics use: yes versus no (reference)	9.6 (−2.7 to 21.9)	0.12

*The values are given as the regression coefficient, with the 95% CI in parentheses. †The adjusted correlation coefficient is 0.19. ‡The adjusted correlation coefficient is 0.07. §The adjusted correlation coefficient is 0.14.

group (two prescriptions) and the multiple-provider group (seven prescriptions), in duration of postoperative narcotic use ($p < 0.001$) between the single-provider group (twenty-eight days) and the multiple-provider group (110 days), and morphine equivalent dose per day ($p = 0.002$) between the single-provider group (26 mg) and the multiple-provider group (43 mg). Separate robust multivariable linear regression analyses with bootstrapping found a significant association between multiple providers and postoperative narcotic prescriptions (regression coefficient, 3.0 [95% CI, 1.8 to 4.2]; $p < 0.001$), longer duration of postoperative narcotic use (regression coefficient, 34.5 [95% CI, 5.1 to 63.9]; $p = 0.02$), and increased morphine equivalent dose per day (regression coefficient, 11.6 [95% CI, 2.7 to 20.6]; $p = 0.01$), after controlling for age, race, insurance, education, alcohol use, and preoperative narcotic use (Table IV).

Discussion

Prescription drug monitoring programs are statewide electronic databases utilized to collect data on controlled substances in an effort to deter diversion, narcotic abuse, and doctor shopping[17]. Prescription drug monitoring programs are effective at decreasing doctor shopping and reducing prescription drug abuse[17]. Currently, forty-seven states have active prescription drug monitoring programs. Maryland and New Hampshire have programs that are not yet operational, and Missouri has pending legislation to enact a prescription drug monitoring program[18]. Seven states have laws in place requiring providers to use their state's prescription drug monitoring database. The present study underscores the potential impact of prescription drug monitoring in the orthopaedic trauma population, which has a 20.8% prevalence of doctor shopping in the postoperative period. Orthopaedic surgeons can utilize the prescription drug monitoring database in their state prior to prescribing narcotics to detect patients who receive narcotic prescriptions from other providers in the postoperative period. Furthermore, we confirmed our hypotheses, as preoperative narcotic use was predictive of multiple providers and patients seeking multiple providers obtained more narcotic prescriptions, a longer duration of narcotics, and a greater morphine equivalent dose per day.

Narcotic prescription abuse is becoming increasingly prevalent across multiple specialties with potentially fatal consequences[6,19]. To our knowledge, only one other study to date has assessed the relationship between multiple narcotic providers and postoperative narcotic use in the orthopaedic trauma population in Utah[12]. Although the studies are different in overall design and detail, the results of our study in a different region of the United States known for a high prevalence of opiate abuse have similar findings with regard to the duration of postoperative narcotic use and the effect of patients seeking multiple providers for postoperative narcotics.

The present findings identify risk factors for doctor shopping in the orthopaedic trauma population and the importance of screening with a controlled substance monitoring database to detect doctor shoppers. Patients with a high school education or less were 3.2 times more likely to seek multiple providers for postoperative narcotics, and patients with a history of preoperative narcotic use were 4.5 times more likely to seek multiple providers. There were also significant differences between the single and multiple-provider groups with regard to number of prescriptions, daily amounts, and duration of narcotic therapy. Although pain control must be individualized on the basis of patient and injury-specific details, patients with a single narcotic provider received a median of two postoperative narcotic prescriptions with 26-mg morphine equivalent doses per day for a period of twenty-eight days. These numbers were greatly magnified in the multiple-provider group, with a median of seven prescriptions for 43-mg morphine equivalent doses per day over a period of 110 days. The magnitude of narcotic prescriptions in this study population rivals the 55-mg average morphine equivalent doses per day reported in patients with chronic pain[15]. Patients receiving 50 to 99-mg morphine equivalent doses per day for chronic pain have shown a 3.7-fold increase in overdose risk and a 1.8% annual overdose rate[14]. Patients who utilize multiple providers should be identified and should be counseled to avoid the potential negative consequences of narcotic overuse, abuse, addiction, and even mortality. Other proposed ways to limit narcotic abuse include narcotic contracts and a systematic approach to narcotic administration and monitoring, which has provided some success[20].

There were several limitations to this study design. Our investigation focused exclusively on patients with isolated, operative orthopaedic trauma injuries admitted from the emergency department and excluded a large percentage of patients afflicted by multisystem trauma or multiple extremity trauma. Our hope was to remove potentially confounding variables from the analysis; however, the data may not be representative of patients with multiple traumatic injuries. Furthermore, we were unable to determine why patients were being treated with narcotics preoperatively and why they sought additional providers and additional narcotic prescriptions postoperatively. There may be additional injuries or conditions requiring narcotic prescriptions of which we were not aware in addition to the operative orthopaedic injury. We chose to define the end point of postoperative narcotics to be the last prescription given by the treating surgeon (or extender) because it would be impossible to determine the reason why patients continued to seek narcotic prescriptions beyond that time point. This may underreport the duration of postoperative narcotics as patients may continue to seek other providers for narcotics because of the traumatic orthopaedic injury and postoperative pain. Another limitation of the study was that the decision to prescribe narcotics, the type of narcotic to prescribe, and the duration of the prescriptions were at the discretion of the treating physician. Five fellowship-trained orthopaedic traumatologists had patients included in the study and no strict protocol was in place at our institution for narcotic prescriptions at the time of discharge or at subsequent clinic follow-up visits. Finally, our investigation was limited to patients residing in the state of

the treating institution. Patients residing in other states were excluded because they are not included in our state's prescription drug monitoring database. As a result, some patients residing in our state could potentially obtain narcotics from neighboring states during the postoperative period, causing our data to underestimate the prevalence of doctor shopping. There is ongoing work to improve interstate sharing and interoperability of state prescription drug monitoring programs[21].

This study identified a 20.8% prevalence of doctor shopping postoperatively in the orthopaedic trauma population. Those patients with a history of preoperative narcotic use and/or a high school education or less are particularly at risk. Orthopaedic surgeons must prescribe narcotic medications in the postoperative period with great care and vigilance to minimize the risk of abuse, dependence, and narcotic-related adverse events in their patients. ■

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