Research Article

Opioid Prescribing Practices of Orthopaedic Surgeons: Results of a National Survey

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Abstract

Introduction: Opioids are widely used after orthopaedic procedures. Nonmedical opioid use is a growing public health issue.

Methods: An anonymous online survey was distributed by e-mail to the orthopaedic societies of all 50 states and several large private practices to assess practicing orthopaedic surgeons' opioid prescribing practices.

Results: A total of 555 orthopaedic surgeons practicing in 37 states responded. The most commonly prescribed opioid for both teenagers and adults was hydrocodone/acetaminophen. Of note, 42.3% reported that a patient they have prescribed opioids for developed an opioid dependency, whereas 35.3% do not believe that opioid use is a problem in their practice. Of note, 30.3% reported prescribing refills, and factors significantly associated with increased prescribing of refills included a greater number of years in practice ($P < 0.001$) and practicing in a suburban rather than an urban or rural environment ($P = 0.03$).

Conclusion: Orthopaedic surgeons rarely prescribe any refills, tend to prescribe less opioids to teenagers than adults, and prescribe fairly uniformly for patients who are treated nonsurgically or undergo minor or arthroscopic surgery. They exhibit considerable variation in prescribing for fractures and major procedures.

Opioid-based analgesia is widely used and is effective in the management of pain after orthopaedic procedures.[1] The nonmedical use of prescription opioids is an increasing public health issue in the United States, though. Twelve million people used prescription pain medication for nonmedical purposes in 2010,[2] and other than marijuana, no drug is more commonly abused by Americans.[3,4] This causes more deaths annually than cocaine and heroin combined,[4] and heroin use is 19 times higher among individuals who have abused prescription opioids than among those who have not.[5] The number of estimated new heroin users increased from 106,000 to 178,000 between 2007 and 2011, and according to one survey, 79.5% of individuals who began using heroin within the past year had previously abused prescription opioids.[5] Orthopaedic surgeons are the fifth highest prescribers of opioids in patients aged 30 to 39 years and the third highest prescribers in patients older than 40 years.[6]

Prescription opioid use is particularly concerning among teenagers, who are vulnerable to substance abuse issues.[5] In one survey, 17.6% of high school seniors had used prescription opioids medically and 12.9% had used them nonmedically.[7]

Table 1

Defined Daily Dose Range and Equianalgesic Ratio for Various Opioids and Formulations

Drug	Adm.	DDD (mg)	Range	Equianalgesic Ratio
Morphine	PO	100	1	1
Morphine	PA	30	—	3
Oxycodone	PO	75	1.3–2.0	1.5
Buprenorphine	TD	1.2	110	110
Buprenorphine	SL	1.2	33.3-60	50
Fentanyl	TD	1.2	68-150	100
Fentanyl	SL	0.6	50	50
Hydromorphone	PO	20	3.6-8.0	6
Ketobemidone	PA	50	3.0	3
Ketobemidone	PO	50	1	1
Pethidine	PO	400	0.03-0.13	0.1
Codeine	PO	90/120[a]	0.05-0.15	0.1
Tramadol	PO	300	0.1-0.2	0.2
Dihydrocodeine	PO	150	0.1-0.16	0.13
Dextropropoxyphene	PO	140[a]	0.15	0.15

DDD = defined daily dose, PA = parenteral, PO = per oral, SL = sublingual, TD = transdermal
[a] The DDD for these compounds is based on combinations with paracetamol.
Equianalgesic ratio: potency of respective opioid/opioid formulations compared with oral morphine.
Adapted with permission from Svendsen, K, Borchgrevink, P, Fredheim, O, Hamunen, K, Mellbye, A, Dale, O: Choosing the unit of measurement counts: The use of oral morphine equivalents in studies of opioid consumption is a useful addition to defined daily doses. *Palliat Med* 2011;25:725-732.

Orthopaedic surgeons are common care providers for this population, as 2 million high school athletic injuries occur each year,[8,9] and approximately one in four emergency department visits by children and adolescents are related to sports injuries.[10] In one study, males who participated in high-injury sports (eg, wrestling, football) had 50% higher odds of nonmedical use of prescription opioids than adolescents who did not participate in those sports,[11] and opioid prescriptions nearly doubled among adolescents from 1994 to 2007.[3] This underscores the importance of safe prescription practices, and several studies have surveyed physicians to determine what prescription practices are currently being used.[12-16] Despite prescribing prescription opioids at a higher rate relative to other physicians[17,18] and treating adolescents with a high frequency, we are unaware of any previous study focusing on opioid prescribing practices among this group.

The relative strength of opioid medications is an important consideration when prescribing these medications for pain control. Previous studies have attempted to determine equianalgesic ratios between various opioids and morphine (Table 1, reprinted with permission).[19] A patient's height and weight influence the volume of distribution of standard dosages of these medications, and genetic variations in pharmacokinetics and pharmacodynamics can influence an individual patient's response to one medication relative to another,[20] but these equianalgesic ratios can provide a baseline understanding of the relative amount of opioid activation provided by varying dosages of medications commonly used in this setting.

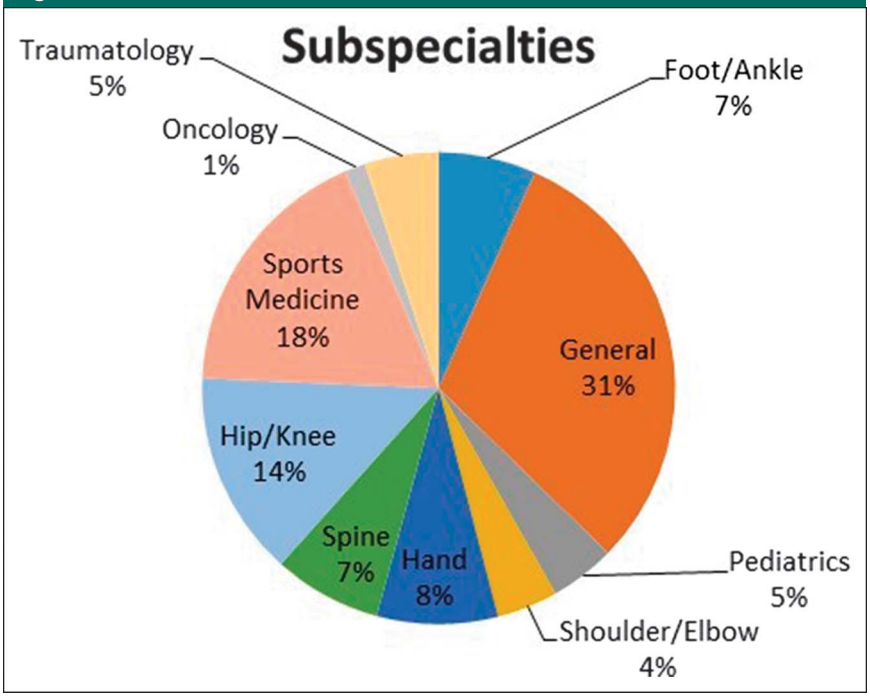
This study surveyed orthopaedic surgeons on current opioid prescription practices for common orthopaedic surgeries and conditions in both teenagers and adults. We hypothesized that there would be wide variation in opioid prescribing practices for any given orthopaedic procedure and that some orthopaedic surgeons would overprescribe relative to their peers.

Methods

Surveying

An anonymous online survey (see Appendix, Supplemental Digital Content 1, http://links.lww.com/JAAOS/A157) was used to assess practicing orthopaedic surgeons' opioid prescribing practices. The survey was developed based on other published prescribing practices surveys, as well as expert opinion.[21,22] The survey was initially piloted at our institution and modified for length and phrasing before wider distribution.

Figure 1



Pie chart showing the distribution of subspecialties within orthopaedic surgery among surgeons who completed the questionnaire.

We first distributed the survey through the Pennsylvania Orthopaedic Society, via both mass e-mail and physical distribution at their fall 2015 annual meeting. We then distributed the survey through e-mail to the orthopaedic societies of all 50 states, as well as several large private practices. The e-mails were not all sent at once and were distributed around the time of the orthopaedic societies' annual meetings. Because some societies did not wish to share their mailing lists, we provided the survey and its link to the leadership of the societies for them to distribute. Surveys were distributed digitally from October 2015 until January 2016, and we collected responses to the survey from October 2015 until March 2016, giving respondents 2 months to respond to the survey after it was distributed to them. We have estimated our overall response rate based on our response rates from the Pennsylvania Orthopaedic Society sampling because it was the only state society that we have accurate survey distribution and denominator data for.

The survey asked which opioid medications surgeons would typically prescribe to an adult or teenager for a given procedure, how many tablets they would provide, how many refills they would authorize, the surgeons' backgrounds, and whether practice protocols were in place for opioid prescribing at their clinic.

Statistical Analysis

Statistical analysis was performed using the R statistical package (R Foundation for Statistical Computing). Demographics were assessed descriptively, and associations were analyzed using the Fishers exact test for categoric variables and the Mann-Whitney *U* test for continuous variables. Associations were considered significant at a *P* value less than 0.05. Because this is a pilot study on prescription practices, a power analysis was not preformed.

Results

Surgeon Demographics

A total of 555 orthopaedic surgeons practicing in 37 states and the District of Columbia responded to the survey, with a response rate of 15%. The state with the most respondents was California (36.6%), followed by Pennsylvania (15.3%), Texas (8.1%), Michigan (3.6%), and New York (3.6%). Eighteen of the responding states had fewer than 5 responses. Of the respondents, 93% were men, with an average of 28.6 (SD, 12.6) years in practice. The most respondents reported primarily practicing in an urban location (46.7%), followed by suburban (39.3%) and rural (14.1%) locations. The proportion of surgeons practicing in each subspecialty is shown in Figure 1. Most surgeons (57.5%) operated on seven or more patients per week, with 25.8% reporting that they operated on two or more teenagers per week.

Surgeon Prescribing Practices

The typical opioid prescriptions reported by survey respondents for adult and teenage patients undergoing nonsurgical treatment, minor or arthroscopic procedures, reconstructive surgery, and fracture repair are detailed in Tables 2 and 3. A subset of the sample (18.6%) did not report performing major or reconstructive procedures on teenage patients. When all procedures were analyzed as a whole, the most commonly prescribed opioid for both teenagers and adults was hydrocodone/acetaminophen. Forty-six percent of surgeons reported that they typically stop prescribing narcotic medications at 4 weeks or less postoperatively,

Table 2

Reported Prescribing to Adults

Drug	Nonsurgical (n = 542)	Minor Surgery (n = 538)	Reconstructive Surgery (n = 539)	Fractures (n = 528)
Hydrocodone/acetaminophen	22.10%	59.70%	33.60%	47.00%
Oxycodone/acetaminophen 5	3.30%	16.50%	39.90%	31.60%
Acetaminophen/codeine	10.10%	13.80%	3.50%	7.20%
None	64.20%	5.90%	2.80%	4.20%
Oxycodone	0.20%	2.00%	8.00%	3.60%
Oxycodone/acetaminophen 7.5	—	1.90%	9.80%	5.90%
Hydromorphone	—	0.20%	1.30%	0.20%
Morphine	—	—	1.10%	0.40%

Table 3

Reported Prescribing to Teens

Drug	Nonsurgical (n = 539)	Minor Surgery (n = 535)	Reconstructive Surgery (n = 507)	Fractures (n = 516)
Hydrocodone/acetaminophen	8.20%	47.30%	42.20%	45.70%
Oxycodone/acetaminophen 5	1.10%	10.80%	26.00%	17.80%
Acetaminophen/codeine	13.20%	29.00%	11.80%	21.10%
None	77.40%	10.80%	10.80%	10.10%
Oxycodone	0.20%	1.70%	4.30%	2.90%
Oxycodone/acetaminophen 7.5	—	0.20%	3.90%	2.10%
Hydromorphone	—	0.20%	—	—
Morphine	—	—	0.80%	0.20%

whereas 40% reported typically stopping between 4 and 8 weeks postoperatively, and 14.4% reported typically stopping at greater than 8 weeks postoperatively.

Overall, only 30.3% of surgeons prescribed any refills. Most refills were prescribed for reconstructive procedures and fractures for both teenage patients and adults (Table 4). A smaller proportion of surgeons prescribed refills to teenagers than adults (20.7% versus 27.9%), and prescribing refills to adults was significantly associated with prescribing refills to teenagers ($P < 0.0001$). A greater number of years in practice (30.5 versus 27.8 years) was significantly associated with prescribing any refill ($P < 0.001$). Location of practice was also associated with prescribing any refill ($P = 0.03$), with suburban practitioners reporting higher refill prescribing than expected and urban and rural practitioners prescribing less than expected. Prescribing any refills was not associated with physician subspecialty or the number of surgeries performed weekly ($P = 0.33$ and $P = 0.33$, respectively). Prescribing any refill was also not associated with whether the physician had a patient in the past who developed an opioid addiction ($P = 0.71$), whether the physician discussed opioid use with their patients ($P = 0.24$), whether their office used a pain management protocol ($P = 0.64$), and whether they believed opioid dependence was an issue in their practice ($P = 0.91$).

Table 4

Percentage of Respondents Who Reported Prescribing Refills (n = 555)

Factor	To Adults	To Teens
Nonsurgical	5.6	4.9
Minor surgery	10.1	7.9
Fractures	19.6	14.6
Reconstructive	23.2	15.0

Among respondents to this survey, 42.3% reported that they had knowledge of a patient that they have prescribed to who developed an opioid dependency. Forty-six percent reported that they agreed that opioid use was an issue in their practice, 35.3% did not

believe that opioid use was an issue in their practice, and 18.6% were neutral. In a survey of primary care physicians published in *JAMA* in 2015, meanwhile, 90% reported that they believed that prescription drug abuse was a "big" or "moderate" issue in their communities.[23] Surgeons' beliefs regarding whether opioid use was an issue in their practice was not associated with a surgeon's number of years of practice ($P = 0.42$), practice location ($P = 0.21$), use of a pain management protocol ($P = 0.11$), or whether they discussed previous opioid use with their patient ($P = 0.47$).

Of the respondents to this survey, 85.2% of surgeons reported discussing previous opioid use with their patient before surgery, whereas 46.7% reported that their office uses a pain management or prescribing protocol for narcotics. Meanwhile, in a survey of primary care physicians published in 2007, 56% reported that they had a system established in their clinic to track patients who are prescribed chronic narcotics, and 75% reported having a policy established for after-hour narcotic replacement.[15] Knowledge of a previous patient who had developed an opioid dependency was not associated with whether a surgeon would discuss previous use ($P = 0.18$) or with reporting that their office used a pain management protocol ($P = 0.23$). Those working in a practice using a pain management protocol reported discussing previous use more often than those who do not use a protocol ($P < 0.005$).

Most surgeons (65.2%) reported that they believed that the most common way for teenagers to obtain narcotics was through their parent's medication supplies, followed by purchasing from a friend (17.3%).

Subgroup Analysis

As a large subset of our sample reported from California, we performed a sensitivity analysis to analyze whether there was an undue effect of their responses on the average prescriptions. Overall, the respondents from California had more practice years on average (31.7 versus 26.8), and a higher proportion practiced in an urban setting than respondents from the other states (57.6% versus 40.3%). Respondents from California tended to prescribe similarly to other states, except for adult fractures and adult reconstructive procedures, where the most commonly prescribed medication was hydrocodone/acetaminophen instead of oxycodone/acetaminophen 5/325.

Conclusion

Although opioids are widely used for postoperative pain control after orthopaedic procedures,[1] issues related to the nonmedical use of prescription opioids have been described as an epidemic in the United States. The nonmedical use of opioid medication causes more deaths annually than cocaine and heroin combined,[4] and heroin abuse is 19 times higher among individuals who have abused prescription opioids than among those who have not.[5] To better define the role of orthopaedic surgeons in fueling this issue, we endeavored to define the current practices of orthopaedic surgeons in the United States.

To our knowledge, this is the only published survey of orthopaedic surgeon opioid prescribing practices to date. It demonstrates that orthopaedic surgeons tend to prescribe fairly uniformly for patients who are treated nonsurgically or undergo minor or arthroscopic surgery but exhibit considerable variation in prescribing for fractures and major procedures. Most surgeons do not prescribe any refills, and morphine, hydromorphone, and oxycodone are rarely prescribed. Surgeons report prescribing less opioid medication to teenagers than adult patients, 42.3% reported that they were aware of a previous patient who had developed an opioid addiction, 85.2% reported that they discuss opioid use with their patients before surgery, and 46.7% reported that their office uses a pain management protocol. Importantly, physicians who reported working in a clinic using an opioid prescription protocol were more likely to discuss these medications with their patients preoperatively, indicating that increased utilization of these may be a way to spur better physician-patient communication.

In this study, less than a third of surgeons reported prescribing refills for opioids, and most of these refills were prescribed for major procedures and fractures. A recent study in pediatric patients undergoing spinal fusion found that 72% did not require any refills.[24] At least one study has shown that less than 10% of their patients needed a refill on their prescription and that 89% of the patients used less than 20 hydrocodone after common sports medicine procedures.[25] In this context, the practice of typically providing refills needs closer examination.

Most surgeons (65.2%) reported that they believed that the most common way for teenagers to obtain narcotics was through their parent's medication supplies, followed by purchasing from a friend (17.3%). The 2013 and 2014 National Survey on Drug Use and Health from the Substance Abuse[26] and Mental Health Services Administration reported that most of those who misused prescription painkillers got them from a friend or relative, in line with what most surgeons reported. However, the second most commonly reported means of obtaining narcotics according to the 2013 and 2014 National Survey on Drug Use and Health was from a doctor. These data show that most surgeons seem

to have some understanding of where their patients or nonprescription opioid abusers are most likely to obtain narcotics for nonmedical use but may underestimate the role that they play in contributing to this issue. It also highlights the importance of proper disposal of opioids following cessation of usage after an orthopaedic procedure, and a recent study in pediatric patients found that only 59% planned to dispose of their unused medications in a manner recommended by the US Food and Drug Administration.[24]

Because this is the first nationwide study on the opioid prescribing habits of orthopaedic surgeons, it provides a barometer for groups interested in assessing their opioid prescription practices. Medical practices, state orthopaedic associations, hospital systems, or other groups could use these results to conduct internal surveys of their practitioners to assess their prescription practices relative to nationwide trends. To aid in this process, we have provided the original text of our survey in the supplemental section of this article. This study may also encourage surgeons and their practices to begin to develop their own pain management protocol because it seems that utilization of a pain management protocol improves patient-physician communication preoperatively.

This study has several limitations. Our survey used some generic terms for orthopaedic surgery and conditions, and this may have led to variation in interpretation and response. Because of the anonymous nature of the survey, we could not confirm that every respondent was a current surgical orthopaedic surgeon. We distributed the survey through several large private practice groups and indirectly via state medical societies. This indirect distribution meant that we could have introduced a possible sampling bias because only practicing orthopaedic surgeons who are members of their local and state medical societies or those who are a part of large orthopaedic practices were solicited to participate. It also meant that we could not obtain an accurate overall response rate. We estimated our response rate from the Pennsylvania Orthopaedic Society sampling because it was the only group in which we could obtain both an accurate gauge of the distribution and an accurate denominator. Our response rate from the Pennsylvania Orthopaedic Society was approximately 15%. Finally, as this issue has rapidly gained the attention of the general public, many state laws, or specific policy guidelines have been enacted. This includes policies aimed at the establishment of pain clinics, policies requiring physicians to use and review Prescription Drug Monitoring Programs, and guidelines directly aimed at prescription practices such as those in use in Washington state, those proposed by Medical Board of California, among others.[22,27-29] We were not able to analyze the influence these may have had on prescribing practices in various states.

Because this is a descriptive study, these findings should not be considered a recommendation for prescribing practices. There is no reason to assume that any of the surgeons who responded to this survey had evidence-based reasoning underlying their prescribing practices. Managing the immense risk associated with overprescribing opioids alongside the need for sensible pain management postoperatively remains a complex issue. For this reason, the development of evidence-based opioid prescription guidelines in the postoperative setting[27] similar to the guidance provided for chronic prescription practices would greatly aid surgeons in their attempts to responsibly use these medications.

Future research on opioid prescribing practices by orthopaedic surgeons is needed. Analysis of variations in prescribing practices between states with different laws regarding opioid prescriptions would help decipher the effects this legislation has on prescribing practices, and additional research is needed regarding the amount of these medications that patients use postoperatively. To date, we are aware of only a few studies, which have analyzed patient-reported postoperative opioid use in the orthopaedic setting.[24,30] These studies have demonstrated that patients typically have leftover pills after they stop taking opioids postoperatively, and every unused pill that is not disposed of carries some degree of risk that it will eventually be taken for nonmedical purposes. It is absolutely vital that every effort be made to limit excessive prescriptions. Whereas this study documents how many orthopaedic surgeons currently prescribe, additional research into how many of these medications patients actually take after various surgeries would provide an evidence base for physicians to use in determining how much they should prescribe.

References

Evidence-based Medicine: Levels of evidence are described in the table of contents. In this article, references 1, 3, 7, 9, 10, 17, 18, and 30 are level II studies. Reference 14 is a level III study. References 20 and 25 are level IV studies. References 2, 4-6, 8, 11-13, 15, 16, 19, 21-24, and 26-29 are level V studies.

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