Current State of the Opioid Epidemic as it Pertains to Pediatric Orthopaedics From the Advocacy Committee of the Pediatric Orthopaedic Society of North America

Ellen M. Raney, MD,* Harold J.P. van Bosse, MD,† Kevin G. Shea, MD,‡ Joshua M. Abzug, MD,§ and Richard M. Schwend, MD∥

Introduction: The opioid epidemic in the United States has reached crisis proportions. Urgent response is needed. Hydrocodone in combination with acetaminophen is the most prescribed drug in the United States. The most common source of opioids available for misuse is the unused portions of postoperative prescriptions. Among high school seniors, 80% of those who reported nonmedical use of prescription opioids previously had legitimate prescriptions but recreationally used leftover doses. Roughly one-quarter of patients do not take any of their postoperatively prescribed opioids and the remainder take one-third to two-thirds of the prescribed doses.

Methods: A summary of the literature is presented beginning from historical perspective to current status and pertinent strategies in dealing with this complicated problem. This review includes data from an electronic survey of the members of the Pediatric Orthopaedic Society of North America (POSNA) with regard to the prescriptions they would provide for 7 treatment scenarios.

Results: Strategies for the preoperative, intraoperative, and postoperative phases of management of pain as well as strategies for education, research, and advocacy are presented. The Pediatric Orthopaedic Society of North America survey yielded 264 respondents. The 3 most commonly used opioid medications were hydrocodone, oxycodone, and acetaminophen with codeine, in that order, for most of the scenarios. The time period covered by postoperative prescriptions varied considerably.

Conclusions: The magnitude of this problem is overwhelming. Education of care providers, patients and families, standardization of narcotic prescribing practices which incorporate patient characteristics, and appropriate plans for disposal of unused narcotics are immediate concepts to consider in correcting this problem. Long-term issues to tackle will be changing patient family expectations, legislation, and obtaining additional resources directed towards this issue.

Key Words: opioids, pain, pediatric, orthopaedic, surgery

(J Pediatr Orthop 2018;00:000–000)

The opioid epidemic is increasingly being recognized as a serious medical and societal issue in the United States, including the role of the medical community in fostering the crisis. Hydrocodone in combination with acetaminophen is the most prescribed drug in the United States. One-third of all patients who visited an emergency department in the United States have opioids prescribed at discharge. Orthopaest rank fourth among the top prescribers of opioids, behind primary care providers, internists, and dentists. The primary focus of this article is a review of the literature on the treatment of acute noncancer pain as it pertains to the practice of pediatric orthopaedics.

HISTORICAL PERSPECTIVE

The roots of this problem date back to the 1980s and 1990s when health care regulatory organizations and watchdog groups advocated opioid treatment of pain as a moral imperative. In 1996, the American Pain Society (APS) introduced the phrase “pain as the fifth vital sign” to emphasize pain assessment as important as assessment of the standard 4 vital signs and that clinicians need to take action when patients report pain. Freedom from pain became synonymous with good patient care. The Joint Commission and the Center for Medicare and Medicaid Services evaluated hospitals on the documentation and treatment of pain. The goal in part was to encourage physicians to be more aware of patients’ pain and modify prescribing patterns accordingly. Patient satisfaction surveys on medical care delivery were weighted heavily towards the patients’ perception of appropriate pain control, with the inadvertent effect of not only assessing the patient satisfaction but also influencing professional status of the treating physicians, along with influencing their reputations and those of their hospitals. The recommendations for assiduous pain control contributed to a substantial

From the *Shriners Hospitals for Children, Portland, OR; †Shriners Hospitals for Children, Philadelphia, PA; ‡St. Luke’s Health System, Boise, ID; §Department of Orthopedic Surgery, University of Maryland Medical Center, University of Maryland School of Medicine, Baltimore, MD; and ∥Department of Orthopedic Surgery, Children’s Mercy Hospital, Kansas City, MO.

None of the authors received financial support for this study.

J.M.A. has received consulting fees from Axogen Inc. and Royalties from Springer. R.M. S. is a paid consultant for K2M and Medtronic. The remaining authors declare no conflicts of interest.

Reprints: Ellen M. Raney, MD, Shriners Hospital for Children, 3101 SW Sam Jackson Park Road, Portland, OR 97239.

E-mail: eraney@shrinetnet.org.

Copyright © 2018 Wolters Kluwer Health, Inc. All rights reserved.

DOI: 10.1097/BPO.0000000000001143
increase in the use of prescription narcotics that persisted in the decades following and continues today.1,4–6

Subsequently, the huge inherent risk to patients, when opioid medications were increasingly accessible, became apparent. Dependence or addiction to opioid medication has been reported to occur as quickly as 2 months in 34% of people (terminology in opioid misuse conditions is summarized in Table 1).1,2,4 Sixteen percent of the US population (40 million people) currently has an opioid addiction, a staggering statistic compared with the number of people afflicted with heart disease (27 million), diabetes (26 million), and cancer (19 million).6 The disease burden due to opioid addiction exceeds half a trillion dollars annually. Between 2002 and 2014, nearly half a million Americans died from prescription drug addiction and overdose deaths.1

An analysis of the National Poison Data System over a 16-year period (2000 to 2015) yielded 188,468 reports of exposures to prescription opioids in persons below 20 years of age. Hydrocodone accounted for the largest proportion of exposures (29%). There was a bimodal age peak, with children 0 to 5 years of age most common (60%), followed by teenagers (30%). In the teenagers, two-thirds of those exposed were intentional, with engaging in risk taking behavior as the most likely cause of opioid poisoning in that age group. The majority of teenage fatalities from intentional opioid exposures were in boys, although girls were suspected of a greater proportion of suicidal intentions. The cause of opioid poisoning in the 6 to 12 years of age range was usually therapeutic mistake of dosage. Children below 6 years of age became exposed unintentionally, probably due to exploratory behavior combined with access to medical cabinets and handbags.1,2

Young children are particularly susceptible to poisoning from unsecured prescription narcotics in the home. A recent change in the nature of the epidemic that has affected all age groups including children has been the illicit manufacturing of synthetic opioids such as fentanyl and the resulting spike in deaths. Children have been reported to die after accidental ingestion or skin exposure of fentanyl, which is highly potent and toxic to young children.13

**TABLE 1. Definitions of Commonly Used Terms Related to Opioid Misuse**

| Term         | Definition                                                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|---|
| Opioid addiction | Addiction is a primary, chronic and relapsing brain disease characterized by an individual pathologically pursuing reward and/or relief by substance use and other behaviors                               |
| Opioid use disorder | A DSM 5 diagnosis with at least 2 major symptoms in a 12-month period (such as tolerance, craving, or withdrawal symptoms)                      |
| Opioid dependence | Dependence is a state in which an organism functions normally only in the presence of a drug, manifested as a physical disturbance when the drug is removed (withdrawal) |
| Opioid tolerance | In general, tolerance to a drug is a phenomenon that occurs when an individual over time requires greater amounts of a drug to continue to obtain the original degree of its desired, therapeutic effect |

**CURRENT SITUATION IN CHILDREN AND ADOLESCENTS**

Although it receives less attention, the dilemma in the pediatric and teenage population is no less dire. When surveying lifetime experiences of high school seniors, 17.6% reported having had medical (legitimate) use of prescription opioids, and 12.9% reported nonmedical use of prescription opioids (NMUPO). Eighty percent of those with NMUPO initially had a legitimate prescription for opioids but used the leftover medications from their prescription recreationally. In total, nearly 1 in 4 high school seniors in the United States had had some exposure to prescription opioids.8 Another study of twelfth graders found that a legitimate opioid prescription increased their risk of future opioid misuse after high school by 33% over a similar twelfth grader who had never been prescribed opioids.9 In a cross sectional study of nearly 3000 adolescents (51% female), 24% had been exposed to opioids in the past year, with 13% initially having a legitimate prescription, approximately half of whom were also among the 18% that reported NMUPO (either their own or someone else’s prescription). The most common reasons for opioid use were solely for pain relief (52.6%), for “nonpain relief motives” that is relief from anxiety or recreational use (15.8%) and a combination of the 2 in the remainder. Among those students who received a legitimate prescription of opioids (nearly 400 of 3000), 82% reported using it appropriately and 18% reported medical misuse.10 Evidence suggests that younger students are also vulnerable. Among seventh and eighth graders, a prospective longitudinal study found a prevalence of NMUPO over the past 12 months of about 5%, second only to alcohol. Among those exposed to opioids in middle school, whites showed a clear increase in probability of NMUPO over time compared with nonwhites, especially during the transition from middle to high school.11

An analysis of the National Poison Data System over a 16-year period (2000 to 2015) yielded 188,468 reports of exposures to prescription opioids in persons below 20 years of age. Hydrocodone accounted for the largest proportion of exposures (29%). There was a bimodal age peak, with children 0 to 5 years of age most common (60%), followed by teenagers (30%). In the teenagers, two-thirds of those exposed were intentional, with engaging in risk taking behavior as the most likely cause of opioid poisoning in that age group. The majority of teenage fatalities from intentional opioid exposures were in boys, although girls were suspected of a greater proportion of suicidal intentions. The cause of opioid poisoning in the 6 to 12 years of age range was usually therapeutic mistake of dosage. Children below 6 years of age became exposed unintentionally, probably due to exploratory behavior combined with access to medical cabinets and handbags.12

Young children are particularly susceptible to poisoning from unsecured prescription narcotics in the home. A recent change in the nature of the epidemic that has affected all age groups including children has been the illicit manufacturing of synthetic opioids such as fentanyl and the resulting spike in deaths. Children have been reported to die after accidental ingestion or skin exposure of fentanyl, which is highly potent and toxic to young children.13

**PEDIATRIC ORTHOPAEDIC SOCIETY OF NORTH AMERICA (POSNA) SURVEY**

To better understand the prescribing practices of its members, the POSNA conducted a survey in 2016, where members were asked to consider 7 treatment scenarios, and state whether they would provide prescriptions for outpatient oral opioids, which opioids, and for how long (Fig. 1). Nearly 25% of the membership responded (264 respondents), of which 68% had > 10 years of experience, 19% had 1 to 5 years of experience, and 13% had 6 to 10 years. Seventy-five percent of the respondents stated they made the pain management decisions for their patients.14

**Definitions of Commonly Used Terms Related to Opioid Misuse**

- **Opioid addiction:** A DSM 5 diagnosis with at least 2 major symptoms in a 12-month period (such as tolerance, craving, or withdrawal symptoms)
- **Opioid use disorder:** Dependence is a state in which an organism functions normally only in the presence of a drug, manifested as a physical disturbance when the drug is removed (withdrawal)
- **Opioid tolerance:** In general, tolerance to a drug is a phenomenon that occurs when an individual over time requires greater amounts of a drug to continue to obtain the original degree of its desired, therapeutic effect
patients, 3% used a pain specialist (pediatrician, pain physician, nurse practitioner, or anesthesiologist), and 22% made their decisions in concert with a pain specialist. The study found that the 3 most commonly used opioid medications were hydrocodone, oxycodone, and acetaminophen with codeine, in that order, for most of the scenarios (Fig. 1). Oral morphine, hydromorphone, nalbuphine, and tramadol were represented in nearly all the treatment scenarios. There did not seem to be much, outside of anecdotal experience, that informed the decision on which medication to prescribe. The time period the respondent expected to treat severe pain, most likely reflecting the amount of medication prescribed, also varied considerably, usually less than a week, but for some practitioners up to ≥4 weeks or more, even for procedures such as knee arthroscopies. Many of the respondents noted that their state was beginning to impose laws restricting how many days an opioid prescription could cover, and that refills could not be handled by telephone.

Fifty-eight percent of respondents stated that they had provided their patients with a “prophylactic prescription,” to cover patients who ran out of their pain medication but due to distance or timing (a weekend or holiday) could not return to the physician’s office to request a refill prescription in person.

These findings are concerning from the standpoint of health care decisions being made surrounding opioids for pain management without sufficient understanding, research, or consensus on best management strategies. For example, hydrocodone was the most commonly used opioid for the pediatric orthopaedic population, but as noted above, it is the most common causal medication in opioid poisonings in children and adolescents.12 Importantly, the repercussion of these practices could potentially be a surplus of medications at the patient’s or family’s disposal for possible future drug diversion. As previously stated, 80% of high school seniors who reported NMUPO had recreationally used leftover medications.

**FIGURE 1.** Opioid type and duration prescribed by respondents to Pediatric Orthopaedic Society of North America member survey.
from a legitimate prescription. In another study, nearly 1500 adult upper extremity patients used only 34% of pills prescribed postoperatively for elective upper extremity surgery and none of the prescribed pills were taken by 28% of patients. A smaller review of 72 patients undergoing posterior spinal fusion for adolescent idiopathic scoliosis (AIS) noted a mean use of only 66% of the prescribed doses of narcotics.

Difficulties in predicting the amount of pain a patient may perceive after discharge may be related to the level of expectations of postoperative pain, and differences in coping strategies, even between adults and minors. Patients with AIS were noted to have lower satisfaction scores with greater opioid intake, whereas adults with ankle fractures demonstrated no association between the level of opioid intake and their satisfaction. For example, 24% of adults with ankle fractures were still using opioid medication 5 to 6 months postoperatively. Two percent of AIS patients with preoperative pain reported pain at or exceeding the amount the preoperative level at 6 months postoperatively.

**STRATEGIES TO ADDRESS THE PROBLEM**

The magnitude of the problem of prescription opioid use and abuse by children and teenagers is overwhelming. Current research does suggest ways that we can begin to address this crisis through education of physicians, patients, and families, quality, safety, and value initiatives, standardization of narcotic prescribing practices which incorporate patient characteristics and appropriate plans for disposal of unused narcotics. More complex strategies include changing the patient expectations surrounding postoperative pain control, influencing opioid prescribing practices and availability through legislation, and obtaining additional resources directed towards this issue. The need to manage our patients’ pain appropriately should be safely balanced against the potential harm of drug diversion to both the individual and society at large. In the remainder of this article, we hope to provide a foundation for further discussion on this topic among pediatric orthopaedists, other pediatric health care providers, and patients and families.

A set of clinical practice guidelines on the management of postoperative pain has been published in an article by the APS, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists. The article constitutes recommended reading for anyone interested in delving further into this subject. The set of guidelines include 32 recommendations that were based on a systematic review of over 300 articles devoted to postoperative pain management of both children and adults. The strength of each recommendation was based on the quality of evidence and consensus of the expert panel. Applicable recommendations from this article of guidelines are included in the discussion below of the literature grouped by phases of surgical care and referred to as “APS-CPG.”

**PREOPERATIVE CONSIDERATIONS**

Preoperative gabapentin was shown to be beneficial in a randomized study of pediatric spinal fusion patients with idiopathic scoliosis. Patients were given gabapentin was given 30 minutes before going into the operating room. The group receiving gabapentin had lower total morphine consumption in the recovery room and for the first 2 days postoperatively. Pain scores were significantly reduced in the recovery room and the morning of the first postoperative day. The study was limited to the inpatient stay so there is no data on whether such a regimen might also lead to a decreased need for opioids after discharge.

To date, much more literature has been published on preoperative cognitive and emotional support than on preoperative pharmacologic intervention. Preoperative education is intended to offset a portion of the stress associated with surgery. Psychosocial factors including less effective coping strategies, depression, and greater perceived stress are associated with a higher perception of pain for a given nociception. The perception that one’s pain means something is very wrong or will never go away may be categorized as a maladaptive response to nociception known as “catastrophic thinking” which contributes to the perception of pain and postoperative disability. Managing psychological distress and optimizing coping strategies before surgery has been identified as beneficial for decreasing symptom intensity during recovery.

Most of the research conducted in this field related to pediatric orthopaedic procedures has focused on adolescents undergoing spinal fusion for scoliosis. An interesting finding showed that anticipated postoperative pain and actual self-reported pain followed the same trajectory, suggesting that the expectation of pain played an important role in the later perception of pain. This finding was true of all patients unrelated to the extent of opioid intake, number of levels fused or number of osteotomies. Another study used a standardized preoperative orientation and education protocol in addition to usual preoperative counseling for fusion for AIS. The protocol failed to produce lower anxiety rates among the patients randomized to receive the additional education patients than in the control group also undergoing fusion for AIS, although the treatment group and their caregivers reported higher overall satisfaction. Moreover, other studies have shown that if preoperative instructions emphasize coping strategies, perception of postoperative pain is decreased. Literature on cognitive behavioral modalities was reviewed in the APS-CPG with regard to postoperative pain management, and received a weak recommendation based on moderate-quality evidence. Most of these strategies, such as positive imagery, have the best potential for helping if planned and practiced in advance of surgical intervention.
Several institutions nationally have begun to institute a formal preoperative assessment by pediatric hospitalists for major elective pediatric orthopaedic procedures. By having a pediatric hospitalist assess the patient preoperatively, several positive outcomes can occur. First, the patient’s medical comorbidities may be optimized for the planned procedure. Second any potential issues that arise postoperatively can be addressed by a hospitalist already familiar with the patient. Last, the hospitalist can spend the time educating the patient and their family regarding postoperative pain management as well as developing a postoperative pain management plan. Patients in whom significant psychiatric comorbidities are identified during a preoperative evaluation may be appropriately evaluated by a psychologist before undergoing a major planned procedure.

Preoperative education of patients and caregivers should include instruction on the postoperative tapering of narcotics with a specific goal as to when the narcotics should be discontinued. The tapering protocol should include non-narcotic adjuvants. Such instruction could easily be incorporated into the discussion of potential complications of the medications such as nausea, vomiting, and constipation. Preoperative education needs to be geared towards the family’s level of comprehension and health care literacy. Consideration should include the provision of information appropriate to the child’s developmental level. This information should be delivered in a culturally competent manner and be provided both verbally and in the form of written instructions.

**INTRAOPERATIVE CONSIDERATIONS**

Systemic non-narcotic medications, such as IV acetaminophen and ketorolac, given intraoperatively have been found to safely decrease the need for postoperative opioid use. Peripheral and regional anesthesia techniques are also supported by high-quality evidence, ultimately reducing the need for oral medications. The use of epidural analgesia is strongly supported. It is important to implement careful observation during the postoperative period to assure complications such as compartment syndrome are not overlooked.

Recently, the use of continuous infusion of lidocaine during surgery has been reported in nonorthopaedic literature to reduce the postoperative opioid consumption and decrease pain scores more quickly. Another benefit of continuous lidocaine infusion is a quicker recovery of bowel function after abdominal surgery. This method of delivery presents a potentially promising pathway for orthopaedic surgery as well.

**POSTOPERATIVE CONSIDERATIONS**

Multimodal analgesia including the use of acetaminophen and/or nonsteroidal anti-inflammatory drugs is strongly recommended across the literature as is the conversion of hydrocodone combination products to Schedule II no longer allows for providers to phone in prescriptions for these drugs, thus creating a higher burden for prescription refills. In the study of the standardized postoperative prescription program, expectations were established in advance that there would be no new prescriptions on nights or weekends. While beneficial for the authors of that study, a policy of no new prescriptions on nights and weekends may present a challenge for patients who live a long distance from providers and those in rural areas. These challenges may require other solutions.

Consultative expertise would be beneficial in the management of patients with opioid tolerance. Chronic pain is best handled by providers specifically trained to manage these patients. Establishing a relationship with the pain management team, pediatric hospitalists or both will permit the pain management of complex patients being handled by those providers.

Despite growing awareness of the severity of the opioid epidemic, the task of completing postoperative prescriptions is generally relegated to the least experienced member of the surgical team, often the most junior resident. A survey of surgical trainees at Yale revealed that 90% had received no formal training in prescribing postoperative opioids. The most common influences on the size of the postoperative prescriptions were attending preference (95%), concern for patient satisfaction (60%), and fear of potential opioid abuse (60%). The least common considerations included patient preference (19.0%) and patient history of prescription narcotic use (24%). Surgical residents who received formal education in postoperative pain control were significantly less likely to prescribe higher amounts of opioids than those who had not.

The effects of a standardized postoperative prescription program can be significant. At one center, the average prescription size decreased by 15 to 48% for four types of adult upper extremity surgeries. The program included specific prompts to recommend nonopioid medications in preoperative teaching sessions and in the management of postoperative phone calls. Nonpharmacologic measures such as the importance of appropriate elevation, and ice or ice water cuff therapy should not be overlooked nor should the importance of rest or early motion as indicated by the procedure. Staff responsible for evaluating patient concerns should be skilled in empathetic listening and reassurance following appropriate medical assessment of the concerns. The recent changes in the Drug Enforcement Administration classification of hydrocodone combination products to Schedule II no longer allows for providers to phone in prescriptions for these drugs, thus creating a higher burden for prescription refills. In the study of the standardized postoperative prescription program, expectations were established in advance that there would be no new prescriptions on nights or weekends. While beneficial for the authors of that study, a policy of no new prescriptions on nights and weekends may present a challenge for patients who live a long distance from providers and those in rural areas. These challenges may require other solutions.

Protocols should allow the provider leeway to consider the individual needs of the patient. AIS patients with a higher baseline oral narcotic requirement immediately after tapering the patient controlled analgesia (PCA), were more likely to require a prescription refill; as were those with a higher body mass index and higher preoperative pain score on the SRS-22. Patients requiring refills had a higher mean age of 15.9 years versus 14.5 years. The age difference reached statistical significance \( P = 0.038 \). The clinical significance of 1.4 years in teenagers is less clear.

Consultative expertise would be beneficial in the management of patients with opioid tolerance. Chronic pain is best handled by providers specifically trained to manage these patients. Establishing a relationship with the pain management team, pediatric hospitalists or both will permit the pain management of complex patients being handled by those providers.
HEALTH CARE DISPARITY

Alterations in treatment of pain in differing populations remains a concern. Racial disparity was noted in unequal treatment of moderate pain in pediatric patients with appendicitis. Hispanics patients were less likely to receive opioid prescriptions for chronic noncancer pain. Rural areas, especially Appalachia, have had a dramatic increase in controlled drug prescription rates and overdose deaths. Chiao and Wang reported that rural hospitals were less likely to have a pediatric pain service. The prevalent socioeconomic status of the area in which a hospital is located did not correlate with the likelihood of having a pediatric pain service. One potential avenue for reducing such disparities could be through the use of guidelines and standardized prescription protocols. As noted previously, pediatric hospitalists often have the experience to substitute for a formalized pediatric pain service.

DISPOSAL

Appropriate disposal of excess narcotics is essential. In Grant’s study of patients who underwent surgery for AIS, 67% of patients planned to dispose of leftover medications, but 33% stated they planned to keep medications for future use. Mahan noted fewer than half of physician respondents discussed with families what to do with excess narcotics. In the studies by Kim and Chiu the number was only 5% to 6%. The following website should be given to families to inform them of locations for appropriate disposal: https://www.deadiversion.usdoj.gov/pubdispssearch.

If no appropriate disposal site is available any excess narcotics should be mixed with an unpalatable substance such as cat litter before disposal in the garbage. Alternatively, there has been discussion of disposal by flushing the excess narcotics down the toilet but this does raise environmental concerns.

RESEARCH OPPORTUNITIES

The majority of the relevant pediatric literature to date focuses on treatment of pain associated with major surgery. The areas of pediatric outpatient surgeries and trauma currently remain unexplored. A recent literature review relevant to opioid prescription and usage following surgery in adolescents noted just 2 articles discussing dosage and opioid type for orthopaedic injuries. Several of the recommendations published in the guidelines from the APS, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists have not been studied in the pediatric population. More specifically, although preoperative education is strongly recommended by the consensus opinion of a panel of experts, it is supported only by low-quality evidence. Future research should focus not only on the effectiveness of preoperative education, but also on which of the various types are most beneficial. The evidence is contradictory as to whether parents or caregivers assessments of the child’s pain are more accurate. The panel recommended against routine use of basal infusion of opioids with patient controlled analgesia (PCA) for adults but noted insufficient evidence to guide recommendation on the use in children.

The relatively recent appreciation of allelic variants of cytochromes CYP2D6 and CYP3A4 on metabolism of codeine, hydrocodone and oxycodone, resulting in fast and slow metabolizers of the drugs, strongly calls for targeted research on these medications for children to establish safe parameters as serious adverse effects, including fatalities have been reported.

LEGISLATION

Legislative changes may have a substantial impact on opioid prescribing practices. A 19% reduction in prescribed opioids by orthopaedic providers was noted at Boston Children’s Hospital after changes in the Massachusetts law in 2016 limited opioid prescriptions to 7 days except in the setting of chronic pain and initiated a state prescription monitoring program. The law also allowed patients to have a partial fill of their prescription if they did not feel they would need the entire amount prescribed. There was, however, a 15% concomitant increase in the number of patients requesting refills. Notably this increase in refill requests was most common in spine fusion and tumor surgeries, perhaps indicating a need for different strategies for those diagnoses. The article did not address the hardship of getting a paper refill prescription to a patient who lives a substantial distance from the provider.

Every state in the US has now implemented prescription drug monitoring programs (PDMP) which the practitioner will need to be query for each patient when a prescription is written. However, it is unclear if these programs will be utilized as intended, and whether or not they will ultimately improve the current epidemic. Analysis of the national ambulatory medical care survey regarding physicians prescribing tendencies for patients with noncancer chronic pain did not support the effectiveness of PDMPs. Ongoing studies assessing the use and success of these programs will be needed.

CONCLUSION

Stopping the opioid epidemic will require a multifaceted approach. We as pediatric orthopaedists can make a difference by educating ourselves and our trainees, improving our prescribing patterns and encouraging patients to utilize nonopioid and nonpharmacologic modalities to decrease pain. We can also partner with other providers, such as pain management specialists and/or pediatric hospitalists, to establish improved prescribing practices.

Quality, safety and value initiatives should be developed to study and demonstrate the impact of our efforts. National registries through organizations such as POSNA can collect data to help guide future efforts. Researchers need support to seek additional solutions. Advocacy efforts should include funding for research, education, and treatment. Although the disease burden due to addiction exceeds half a trillion dollars annually, in 2010 only 1% of the total health care budget went to treating addiction.
Educators should convey to practitioners, caregivers, and patients the means to prevent and control pain by multiple modalities other than opioids. Several states mandate opioid specific continuing medical education. The American Academy of Orthopaedic Surgeons has developed a helpful toolkit for pain management at (https://www.aaos.org/Quality/PainReliefToolkit/) with which all orthopaedic surgeons should become familiar. A similar toolkit adapted for the pediatric population is needed. Specifically, recommendations for codeine would be eliminated or markedly restricted given the concerns of severe adverse reactions in ultra-rapid metabolizers. The POSNA is planning a symposium dedicated to this topic at the 2018 annual meeting with the intention to subsequently publish the proceedings.

REFERENCES


