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The Opioid Crisis

The Surgeon's Role

Ross F. Goldberg, MD[a,b,*]

[a]Department of Surgery, Maricopa Integrated Health System, 2601 East Roosevelt Street, Hogan Building, Phoenix, AZ 85008, USA; [b]Creighton University School of Medicine - Phoenix, Phoenix, AZ, USA

Keywords

• Opioid epidemic • Health care policy and advocacy • Prescription limitations • Continuing medical education • Enhanced recovery after surgery

Key points

- The opioid epidemic has become a significant public health care crisis in the United States.
- Surgeon overprescribing has played a role in the development of this epidemic, and new evidence-based practices have been implemented to curtail such overprescribing, including the creation of the enhanced recovery after surgery pathways and new multimodal pain management strategies.
- Federal and state legislation has been enacted addressing prescription limitations, new regulations regarding the ability to prescribe, and continuing medical education to better understand pain management options.

INTRODUCTION

Recently, there has been increased awareness and scrutiny of the prescribing habits of physicians and surgeons regarding opioids given the ever-growing presence of opioid abuse and addiction across the United States, culminating in the US government declaring the opioid epidemic a public health emergency on October 16, 2017. The reasons for this epidemic status with opioids are complex. Data have shown that prescribing habits of physicians have played a role, with overprescribing leading to addiction, misuse, opioid dispersion into the community, and potential transformation into illicit drug or heroin use and abuse.

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*Department of Surgery, Maricopa Integrated Health System, 2601 East Roosevelt Street, Hogan Building, Phoenix, AZ 85008. *E-mail address:* Ross_Goldberg@dmgaz.org

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The surgeon's role in this epidemic is complicated. In this profession, surgeons cause acute pain when operating or when treating a trauma or burn patient, and there needs to be a balance between managing a patient's pain and overprescribing to try and obliterate the pain. Further challenging the issue is that recent studies have shown that anywhere between 1% and 13% of opioid-naïve surgical patients developed opioid dependence after a surgical encounter [1–5].

Recent interventions, both in the medical world and through legislation and regulation, has led to a reduction in opioid prescriptions by 8% and prescription opioid overdose deaths by 12% [6,7]. All of this work though has not seemed to affect the escalation of opioid overdosing occurring in the United States, with 64,000 people dying from drug overdoses in 2016. More than 42,000 of those deaths were due to opioids; this is a 20% increase from the total of 52,000 drug overdose deaths from the year before [7–9]. The greatest contributor to these overdoses is related to illegally manufactured fentanyl, accounting for 20,000 deaths, followed by heroin at 15,000 deaths, and prescription drugs for less than 15,000 [7].

The medical community has met this epidemic head on, trying to find ways to minimize the reliance on opioid use while still adequately controlling patients' pain. As with any disease process, there is not a single fix for all patients, and the solution does not solely rest in the medical literature. This article reviews the situations that have led to this current state and discusses areas in which surgeons can be involved to address the opioid epidemic.

TIMELINE OF OPIOID ANALGESIC USE

During the 1980s, there was a movement underway to address the perceived undertreatment of postoperative and cancer pain with opioids, culminating in the 1986 Cancer Pain Monograph produced by the World Health Organization [7,10]. This led to the examination of opioid use outside of the oncology field during the 1990s, with opioids becoming the primary modality of chronic noncancer pain treatment in the United States [7,11]. All of this led to the famous pain as the fifth vital sign campaign in 1995, which was launched by the American Pain Society in an attempt to standardize the evaluation and treatment of pain symptoms [7,12]. In 1999, the Veterans Health Administration adopted the pain as the fifth vital sign initiative, increasing support for the concept [7,13]. This was further engrained by the published standards for pain management in 2000 by The Joint Commission (TJC), accentuating the need for quantitative assessments of pain as recommended by the Institute of Medicine. Meanwhile, the Federation of State Medical Boards and the US Drug Enforcement Agency (DEA) issued statements leading to less regulatory scrutiny of opioid prescribing habits [7,14,15].

These changes, loosening regulations while mandating standards for pain management, led to a series of unintended consequences, the largest being a heavy reliance on opioid medication to remedy what was considered inadequate pain control [7]. Patients came to expect that they should have no pain

at all. Coupled with this new expectation, changes in the reimbursement patterns with regard to physician and hospital quality ratings started to occur at this time. One such change was with the Centers for Medicare and Medicaid Services' Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, implemented in October 2006, seeking the perspective of recently discharged patients on the details of their hospital experience [16]. The original 32-item survey had 3 questions dedicated to how well a patient's pain was managed during their hospital stay [16,17]. These survey results were available to the public, allowing patients to compare hospitals. These results also became linked with CMS payments through the Value-Based Purchasing program [16]. Hospital administrators were concerned that if they ignored the TJC standards and the HCAHPS survey results they were potentially jeopardizing their federal health care funds, which led to some hospitals investing into opioid therapy, leading to better satisfaction rates from their patients [7,18].

Exacerbating this was that during this time the pharmaceutical companies were heavily pushing the use of opioids, presenting it as a humane treatment option for pain management [7]. The medicolegal pressures grew as well, culminating in litigation for undertreating pain, labeling it as inhumane [7,19]. The new paradigm in medical education was to rely on opioids for pain treatment because of all these changes. This also led to the creation of new extended-release formulations of opioids that were frequently prescribed because, ironically, it was presumed there was a lower likelihood of abuse, when in fact they were heavily abused.

A final piece was the limitations on how to prescribe opioids. Although there was less regulatory scrutiny of prescribing habits, patients were still required to obtain a handwritten prescription from physicians to obtain Schedule II substances [16]. These could not be sent electronically or via fax to pharmacies. This included the commonly used opioids

- Morphine
- Oxycodone
- Hydromorphone
- Methadone
- Hydrocodone [16].

This required patients to physically return to their physician's office to obtain a refill, which was a potential inconvenience to both patient and physician, especially given that some patients were traveling great distances to seek care at tertiary and quaternary care hospitals [16]. To avoid some of these inconveniences, there was the potential for some opioid prescriptions to be for more than necessary just in case there were issues with pain management when the patients returned home [16].

THE SURGEON AND OVERPRESCRIBING

As previously mentioned, it is reasonable for surgeons to treat the acute pain they cause. The issue arises with what is considered appropriate postoperative

opioid prescribing because that is poorly defined [16]. The Centers for Disease Control and Prevention (CDC) created guidelines for opioid use in the chronic pain patient [20]; however, there are no guidelines for the acute or postoperative pain patient [16]. This has led to such variability that that there has been found to be a 3-fold to 5-fold difference in prescribing rates in the United States [21]. Studies have shown that surgeons, in particular, account for a large degree of this prescribing variability, with individual surgeons prescribing vastly different amounts for the exact same operation [16,22,23].

Often, the number of pills prescribed exceeds the number of pills used, as evidenced in Table 1, which reviews some of the studies that show the degree of overprescribing occurring with different surgical procedures [16]. Kim and colleagues [28] reported that 66% of opioids went unused after different upper extremity operations [16]. A similar study in general surgery operations, by

Table 1
Results of surgical fields evaluating their postoperative opioid use

Study	Specialty	Number of subjects	Opioid use	Opioid disposal details
Maughan et al, [24] 2016	Dental	74	54% of all pills unused	NR
Harris et al, [25] 2013	Dermatology	72	86% had any pills leftover	53% of patients with leftovers kept
Hill et al, [22] 2017	General Surgery	127	71% of all pills were used	74% of patients with leftovers kept
Bartels et al, [26] 2016	Gynecology	30	53% used 0–5 pills 83% used < half of prescription	77% of patients with leftovers kept
Rodgers et al, [27] 2012	Orthopedics	250	45% used 0–5 pills 77% had any pills leftover	NR
Kim et al, [28] 2016	Orthopedics	1416	66% of all pills unused	Only 5.3% received instructions on disposal
Kumar et al, [29] 2017	Orthopedics	81	37% of all pills unused	75% of patients with leftovers kept
Bartels et al, [26] 2016	Thoracic	31	45% used 0–5 pills 71% had any pills leftover	73% of patients with leftovers kept
Bates et al, [30] 2011	Urology	275	67% had any pills leftover 42% of all pills were unused	91% of patients with leftovers kept

From Theisen K, Jacobs B, Macleod L, Davies B. The United States opioid epidemic: a review of the surgeon's contribution to it and health policy initiatives. BJU Int. 2018; 122(5): 756. Epub 2018 Jul 26; with permission.

Hill and colleagues [22], found 71% of all opioids were unused [16]. A study of dental procedures showed opioids went unused 54% of the time [24], whereas other data showed that 45% of patients undergoing thoracic operations and 54% of patients undergoing cesarean sections only required 0 to 5 opioid pills in the postoperative period [16,26]. When reviewing all these data, it was suggested that surgeons may have served as contributors for opioid overprescribing [16,31].

Between 1997 and 2002, extended-release oxycodone (OxyContin) prescriptions increased from 670,000 to 6.2 million, with overall opioid consumption skyrocketing in the 2000s from 49,946 kg in 2000 to the peak at 165,525 kg in 2012 [7,32,33]. Surgeons had a role to play in this prescription increase. In 2012, a study from the Information Medical Statistics (IMS) Health's National Prescription Audit showed that surgeons accounted for 28.3 million (9.8%) of 289 million opioid prescriptions dispensed [34,35]. In 2015 there were enough prescription opioids dispensed to medicate every adult in the United States with 5 mg of hydrocodone every 4 hours for 3 weeks [16,36]. When compared with the rest of the world, the United States prescribes greater than 50 times more opioids [16,37].

RESULTS OF OVERPRESCRIBING

When these changes regarding opioid practices went into effect, it seemed that there was some success in regard to better pain control, coupled with the thought that opioids had a low addictive potential [38]; however, a short time later, concerns began to arise concerning the amount of treating with opioids. In the past 15 years there has been a quadrupling of prescription opioids sales and mortality in both men and women, as reported by the CDC in their National Vital Statistics System [7,39]. Adding to the concerns has been that, up to now, there has been no level I evidence for the long-term safety of the effect of opioid therapy in treating chronic pain and improving overall function [7]. Instead, there has been an increase in chronic opioid use, and the physical and psychological issues that arise from chronic opioid use, abuse, and addiction.

The evidence has shown that even a single prescription in an opioid-naïve patient can lead to long-term use [2,16,40–42]. A population-based study from Toronto, Canada, evaluated the risk of long-term opioid use in opioid-naïve elderly patients undergoing short-stay surgeries, including varicose vein stripping, laparoscopic cholecystectomy, cataract surgery, and transurethral resection of the prostate, and found that 7.7% of the patients who filled an opioid prescription at the time of surgery were still using prescription opioids 1 year later [2,16]. Another study looked at the risk in opioid-naïve adults undergoing 13 minor and major operations, and found that 6% of opioid-naïve adults who received an opioid prescription perioperatively were still using opioids 3 to 6 months later, and that the rate of use was similar between minor and major operations [16,40]. Similar long-term opioid use rates, ranging from 3.1% to 8.2%, were found in the opioid-naïve population after undergoing an

operation [41,42], supporting the finding that a subset of patients who are exposed to a single opioid prescription are at risk of addiction and long-term use [16].

The evidence even goes as far as to suggest that just a single day's prescription of opioids can result in chronic use [16]. Shah and Marin [43] studied 1.3 million opioid-naïve adults who were discharged from the hospital with a new opioid prescription after medical and surgical admissions. They calculated the rate of opioid use 1 and 3 years after initial prescription, finding that a single day's prescription led to a rate of persistent opioid use at 1 year of 6%, increasing to 13.5% for prescriptions that were for at least 7 days [16,43].

The other issue that arises with overprescribing is the unused excess medications; they are rarely discarded and often stored insecurely [16,22,26]. There is a risk of these pills then being dispersed into a community, which can lead to further misuse and abuse [16]. A survey of adults in the United States who abuse prescription opioids found that 50% obtained their pills from a friend or relative for free, whereas another 15% bought or stole from a friend or relative [16,44]. This is further exacerbated because 1 in 5 adults in the United States admit to sharing their prescription opioids with others [16,45]. The abuse of prescription opioids has the potential to serve as a first step to other illicit drug use because 40% to 80% of heroin users admit to abusing prescription opioids before initiating heroin [16,46,47]. Overprescribing cannot be deemed as the sole cause for these issues but, given all that is now known about the potential for misuse and abuse of opioids, prescribing habits and rates need to be altered.

SOLUTIONS FOR THE SURGEON

There are a variety of ways in which a surgeon can have a positive impact on addressing the current opioid epidemic in the United States. To broadly categorize the avenues available, these can be viewed as the patient care or clinical side, and the health care policy and advocacy side. Each side has a different but equal and important role in addressing the issue.

PATIENT CARE AND CLINICAL SOLUTIONS

Surgeons' understanding of and bias toward pain

It is difficult to fully treat someone's pain without understanding the neuroanatomy of pain itself [48]. One needs to understand tolerance, physical dependence, and addiction to be truly responsible when prescribing opioids. The definition of tolerance is the biophysical modulation of opioid receptors after chronic exposure [48]. With chronic exposure, these receptors require an increase in the amount of activation to get the same result, leading to the need to use increased amounts of narcotics to meet the same level of pain relief [48–50]. Physical dependence is the manifestation of withdrawal symptoms due to cessation of the medication. The most pronounced symptoms of withdrawal include diaphoresis, agitation, tachycardia, vomiting, and diarrhea [48]. Addiction is the term used to describe the behavioral changes that occur,

such as seeking out the medication despite personal harm to themselves or others [48,50].

When approaching any pain management plan, one also must consider specific patient populations and the potential effect of narcotic use on select groups; this helps lead to developing individual plans, decreasing amounts when needed, and changing the timing of medications [48]. One such group is the elderly. Owing to changes of pharmacokinetics and pharmacodynamics related to aging and polypharmacy, careful consideration is needed before any prescribing of narcotics to the elderly [48,51]. Patients with cardiac and pulmonary comorbidities are susceptible to increased cardiac and respiratory depression, whereas renal and liver disease can prolong drug clearance and metabolism, leading to longer medication half-life and adverse events [52–55]. In patients who have obstructive sleep apnea, additive central depression, and decreased neuromuscular tone, opioid use can worsen the obstruction and pulmonary complications [48,56,57].

Surgeons also must realize their implicit biases on assessment and treatment of patient pain [58]. Factors that play into a surgeon's bias when it comes to assessing pain include patient-reported symptom severity, judgments regarding the patients' trustworthiness, a surgeon's preconceived notion of how painful a particular procedure should be, prior clinical experience in managing various disease states, and the degree of empathy that a surgeon feels toward any given patient or patient population [58,59]. What further complicates matters is when the patient's report of pain does not seem to match with the objective clinical signs when assessing for pain [58].

There have been attempts to diminish the subjective nature of a patient's pain complaints through visual aids such as the Wong-Baker Faces Pain Rating Scale; surgeons are trained to take these results with some skepticism [58,60]. There is justification behind questioning a patient who states their pain is 10 out of 10 on stimulation while resting comfortably, there have been reports showing a direct correlation between patient appearance and how trustworthy they seem to their surgeon and caregivers [58]. This is further supported by the evidence that shows that pain judgment biases have been shown to be rooted in clinicians' perceptions of patient ethnicity, age, gender, skin color, socioeconomic status, and attractiveness, with many of these same factors influencing the prescribing patterns of analgesic agents [61–63].

Clinician experience seems to mediate implicit attitudes about pain assessment, which is especially relevant regarding to the surgeon's capacity to manage postoperative pain [58]. An inexperienced trainee may underestimate the pain associated with a particular case or overmedicate a complaining patient at night, whereas an experienced clinician may undertreat patients based on past experiences that remind them of patients with drug-seeking behaviors or overtreat to obtain improved patient satisfaction scores [58]. The first step in addressing these issues is acknowledging the existence of these implicit biases and then findings ways to mitigate their impact on the treatment of postoperative pain.

Identifying patients at risks

As previously reported, even a single day's use of opioids has a risk of leading to misuse, abuse, and addiction. Yet it was also shown that this chance of abuse was not uniform across all opioid-naïve patients, so it is important to try and identify potential risks or characteristics that could put a subsection of patients at a higher risk versus others. It has also been found that the incidence of prolonged opioid use after surgery varied depending on preoperative patient characteristics and the type of operation that the patient was undergoing [64]. In a retrospective analysis of 641,941 opioid-naïve patients undergoing an operation and 18,011,137 opioid-naïve nonsurgical patients, the incidence of chronic opioid use among nonsurgical patients was 0.136%, whereas in the surgical patients the highest incidence of chronic opioid use occurred after total knee arthroplasty (1.41%) [65]. After risk-stratifying and controlling for age, gender, and the preoperative medication used (antidepressants, antipsychotics, benzodiazepines), patients undergoing total knee arthroplasty, open cholecystectomy, total hip arthroplasty, simple mastectomy, laparoscopic cholecystectomy, open appendectomy, and cesarean section delivery were at significantly increased risk for chronic opioid use after surgery [64,65]. This study found that risk factors for chronic opioid use after surgery among opioid-naïve patients included male gender, age greater than 50 years, preoperative use of benzodiazepines, preoperative use of antidepressants, depression history, alcohol abuse history, and drug abuse history [64,65]. In a similar retrospective cohort of 36,177 opioid-naïve patients undergoing minor (eg, varicose vein removal, laparoscopic cholecystectomy, laparoscopic appendectomy, hemorrhoidectomy, thyroidectomy, transurethral prostate surgery, parathyroidectomy, and carpal tunnel surgery) or major (eg, ventral incisional hernia repair, colectomy, reflux surgery, bariatric surgery, and hysterectomy) operations, the risk factors identified for new persistent opioid use after surgery included preoperative tobacco use, alcohol and substance abuse disorders, mood disorders, anxiety, and preoperative pain disorders [40,64].

Another important risk factor for postoperative persistent or chronic opioid use is the use of opioids preoperatively [64]. In a national, population-based study of patients who underwent upper extremity operations, opioid use before surgery was associated with longer opioid prescriptions with an increase in the number of refills postoperatively [64,66]. It has also been found that between 64% to 77% of chronic opioid users before surgery continue their chronic opioid use after surgery [64,67,68]. Additional risk factors include lower socioeconomic status; preoperative pain; medical comorbidities, such as pulmonary disease and heart failure; depression; and a history of drug, alcohol, or tobacco abuse [5,65]. Understanding which populations are at greater risk for abuse allows the surgeon to individualize a postoperative pain management plan to minimize risk of abuse while also allowing the surgeon to build a rapport with the patient and strengthen the patient–physician relationship.

Patient education

A surgeon's understanding of their practice area and patient population gives them the chance to determine whom among their patients may seek increased opioid prescriptions versus those who choose to forego narcotic pain management [69]. There is a risk that patients who choose to bypass narcotics for perioperative pain management may have issues with adequate pain control, which can lead to increased length of stay and a higher risk of perioperative morbidity [69,70]. If one can better understand these patients and make an effort to educate them on the concept and issues of pain management, there is an opportunity for improving pain control and overall patient satisfaction [69]. It has been shown that patient education decreases the need for postoperative opioid use and improves patient satisfaction [69,71,72]. Every patient encounter provides an opportunity to educate the patient, and using interdisciplinary strategies that involve the surgeon, pain management specialists, nurses, physical and occupational therapists, ancillary staff, families, and other patient support systems is considered an ideal approach to helping to control patient pain while simultaneously minimizing opioid use [69,73].

Patient education about pain control should begin at the initial clinical evaluation and carry over to the preoperative visit [69]. There is an opportunity for the surgeon to educate the patient about the procedure, the degree and extent of expected perioperative pain, recovery time, and the realistic expectations of pain management in the outpatient setting during their recovery [69,74]. The counseling of patients regarding adequate pain control should be based on patient function, referring to the ability to sleep, ambulate, and eat [69]. One of the most crucial education points is to emphasize that any expectation of a patient's pain being at zero is unrealistic [69,75]. Hill and colleagues [22] suggested that setting patient expectations about the number of opioid pills that they will require and receive is beneficial in reducing the number of pills prescribed postoperatively. The best education for the patient should start with face-to-face personal encounters, supplemented with culturally and linguistically appropriate written, video, and Web-based educational materials [74]. An example of patient-centered material that can be used to help surgeons develop a pain management plan along with the patient is shown in Table 2.

Education should not only occur preoperatively but during the postoperative phase as well. By educating patients about their multimodal pain control plan that includes nonopioid medications often helps in strengthening the rapport between surgeon and patient, as well as define goals for pain management [69,76]. This is the time is to reinforce what was discussed preoperatively, that zero pain is not attainable and pain control should be based on the ability to perform certain activities of daily living in the postoperative setting [69]. This education should also include how and when to take their medication [69].

Education also needs to go beyond just opioid use to focus on proper and safe disposal of excess opioid medications. The US Food and Drug Administration (FDA) recommends disposing of opioid pills at Drug Enforcement Administration–approved collection sites or community-based drug take-back

Table 2
Chart template for educating patients on opioid options

Generic name	Brand name	Route of administration	Common dose	Length of effect
Oxycodone (immediate release)	Oxycodone	Orally	5 mg	4–6 h
Oxycodone or acetaminophen	Percocet		5 mg oxycodone or 325 mg acetaminophen	
Hydrocodone or acetaminophen	Vicodin Lortab Lorcet HD		5 mg hydrocodone or 325 mg acetaminophen	
Hydromorphone	Dilaudid		2 mg	
Hydrocodone	Hycodan		5 mg hydrocodone	
Codeine/ acetaminophen	Tylenol #3			
Morphine	MorphaBond (extended-release) Arymo (extended-release)	Orally	15 mg	12 h
Methadone	Methadose Dolophine		5 mg	8 h
Oxycodone (extended-release)	OxyContin		10 mg	12 h
Fentanyl	Actiq Fentora Abstral Duragesic	Orally, transdermal (skin patch)	No recommended dose	Dependent on route of administration

From Torres M, Eskander M, Held J, et al. The general surgeon's role in enhancing patient education about prescription opioids. Bull Am Coll Surg 2017; 102(8): 15-20; with permission.

programs, flushing them down the toilet, placing them in a sealable plastic bag, or dissolving the pills in water and mixing them with compostable materials (eg, coffee grounds) and placing the mixture in a sealable bag before placing in the trash [69,77]. This education should be part of the written materials the patient receives on discharge, to ensure that they understand the correct way to dispose of these medications.

Another way to help educate patients is providing them with educational tools and information while they wait for the surgeon in the office in the waiting rooms and patient examination rooms. The idea is to make all material easy to read and understand, while maintaining cultural sensitivity to patient populations.

The US Department of Veterans Affairs has had reductions in outpatient prescribing of risky opioid regimens thanks to the implementation of system-

wide initiatives, showing that patient education programs that offer easily accessible and useful information for veterans and patients have had positive results and safer opioid use [69,78]. One such initiative was the creation of The Opioid Safety Initiative Toolkit, providing a clear explanation of the path between various options and rating the strength and quality of evidence behind each decision of the path [69]. This toolkit is online and helps both patients and physicians with pain management decisions.

Perioperative pain management protocols

Introducing a multimodal approach to postoperative pain management is another avenue with which surgeons can have an impact on the opioid epidemic, by moving away from sole reliance of opioids and introducing new and innovative approaches to postoperative pain control.

A growing subset of pain management is alternative treatment modalities, focusing on evidence-based nonnarcotic interventions to help supplement the treatment of postoperative pain [74]. One of the recommendations from the American Pain Society is scheduling routine nonopioid analgesics as part of the pharmacologic regimen when treating these postoperative patients [48]. The use of nonsteroidal antiinflammatory drugs (NSAIDs), through cyclooxygenase (COX) inhibition, helps prevent the generation of inflammatory mediators such as prostaglandins, which further increase the propagation of nociceptive pain [48]. Other results have shown that combining Tylenol and NSAIDs results in improvement in postoperative pain control, leading to reduced opioid use [48].

Using different forms of perioperative anesthesia, via regional anesthesia (nerve blockade of peripheral nerves) or neuraxial anesthesia (blockade of central nervous system), has been investigated as a way of potentially reducing the risk of postoperative opioid use. This is believed to be successful due to 1 of 2 mechanisms. The first mechanism works through a theory called preventative analgesia [79–81], using the concept that nerve blockade can prevent the transition from acute to chronic pain by directly blocking transmission of pain impulses during the perioperative period, preventing central sensitization and chronic neuropathic pain [64]. The second mechanism is that nerve blocks are a well-established modality for treating acute postoperative pain, which, when severe, can be predictive of the development into chronic pain [64,82]. Regardless, it still has not been shown if these nerve blockades reduce long-term opioid use, even though there has been some success in the acute postoperative period [64].

The use of an intravenous local anesthetic, such as lidocaine, as a way of reducing postoperative opioid consumption has gained increasing interest [64]. The concept is that, by giving this intravenously, a blockade of the proinflammatory responses to surgery occurs, leading to reduced opioid consumption [64,83–85]. Although a recent review of intravenous lidocaine associated it with a decrease in postoperative opioid requirements for a variety of surgeries (eg, abdominal and thoracic procedures), it showed no benefit with others (eg, total hip arthroplasty) [64,83]. Further research is needed to explore the extent to which this modality could be used to mitigate postoperative opioid use.

All these different treatment modalities help feed into the overall concept of enhanced recovery after surgery (ERAS), developed first for colorectal surgery and since expanded to other surgical procedures, to attempt to decrease postoperative adverse events and length of stay [48]. These protocols were developed to address preoperative, intraoperative, and postoperative variables, such as fluid balance and nutrition, to improve efficiency in recovery. A key point of this program is the limitation of narcotic pain medication in the postoperative period, using multimodal pain management with a heavy reliance on nonnarcotic pain medications. For these protocols to be effectively developed and executed, ERAS analgesic regimens need multidisciplinary communication and care coordination [58]. This collaboration must occur between surgeons and perioperative and floor nurses, along with the anesthesiology team, to deliver analgesics beginning in the preoperative patient holding area [58]. Acetaminophen, COX inhibitors, and gamma-amino butyric acid (GABA) analogues given preoperatively help blunt initial nociception and may play a role in decreasing postoperative pain [58]. These agents also constitute the basis of the multimodal postoperative analgesic regimen used in addition to narcotic agents to reduce the reliance on narcotics [58]. This includes incorporating regional anesthesia (nerve blocks, epidurals) and adjunct agents such as intravenous ketamine and lidocaine [58]. Studies have shown that patients complain of less postoperative pain after having these multimodal regimens used in their favor [58,86–88].

Professional surgical organizations have embraced the concept of ERAS and offer information and programs to their members to help them implement these programs. One example is the American College of Surgeons launching the Improving Surgical Care and Recovery program in collaboration with the Agency for Healthcare Research and Quality and the Johns Hopkins Medicine Armstrong Institute for Patient Safety and Quality, providing multidisciplinary strategies for effective perioperative pain management (http://www.facs.org/quality-programs/iscr) [58,89]. Another organization, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), has developed the SMART Enhanced Recovery Program, combining open and mostly minimally invasive surgical approaches with with enhanced recovery care plans, to improve recovery and reduce postoperative narcotic use (http://www.sages.org/smart-enhanced-recovery-program/) [90]. Unfortunately, even with these new provisions put into place, surgeons seem reluctant to change their practices at the time of discharge. A recent study out of the University of California, Los Angeles, found that there was no difference in opioid prescribing at the time of discharge when they compared pre-ERAS with post-ERAS implementation at their institution [16,91]. Without changing postdischarge practices, it will be hard to assess the maximal benefit these ERAS pathways can have.

Other groups are working on gathering real-time data on opioid prescribing habits to combat the issues of overprescribing and opioid abuse. They are then using and publishing these data to help guide fellow surgeons to use fewer narcotics while still maintaining adequate postoperative pain control, working with this new multimodality approach. One such group is the Michigan Opioid

Prescription Engagement Network (OPEN), led by 22 physicians devoted to improving patient care in Michigan, representing all major hospitals and surgical specialties, and funded by Blue Cross and Blue Shield of Michigan (http://michigan-open.org/) [31,92]. Part of this ongoing work has culminated in the online publication of recommended opioid prescribing guidelines for several common operations, listing all common narcotic modalities down to the pill number, which is constantly updated based on new evidence-based data (https://opioidprescribing.info/) [31,93].

Clinician education about opioid management

It is acknowledged that most health care professionals have not received an adequate amount of education regarding pain management during their training [58,94]. This has been further supported when practice patterns have been examined after the introduction of pain management education [58]. One study showed that introducing procedure-specific recommendations enabled surgeons to reduce the number of narcotic pills they prescribed by more than 50% and that patients who received opioids were adequately managed with those initial prescriptions in 80% of the 246 cases examined [58,95]. Currently, there are insufficient formal curricula for pain assessment and management, and these lack breadth and standardization, although efforts have been made to improve on this [58].

For the most part, most residents learn their pain management strategies from their attending surgeons, extended to both analgesic selection and dosing for each level of pain severity, with trends toward opioid use [58]. Junior-level resident pain management strategies often encompass the trial and error approach, arbitrarily changing dosing amounts and frequencies based on the reported level of pain the patient is subjectively stating [58]. Patients with preoperative chronic pain or who have symptoms that cannot be controlled with conventional methods are often referred to a pain management specialist during their postoperative recovery period [58].

It is incumbent on the surgeon to develop a deeper and more meaningful understanding of the relationship between patient symptomology, prescribing patterns, educational interventions, and subsequent outcomes [58]. One example is the University of Toronto, Ontario, Canada, which has instituted a multidisciplinary transitional pain service to manage patients who have chronic postoperative pain and also reduce opioid use [58,96]. Although this group did manage to look at the issues regarding overprescribing, there still needs to be development of understanding and mitigating the development of dependent or chronic postoperative pain [58].

HEALTH CARE POLICY AND ADVOCACY

Federal regulation

Although there have been plenty of changes on the clinical side, the legislative and regulatory bodies have also been active in attempting to curtail the spread of the opioid epidemic. The DEA has implemented several opioid-related

policy changes to help address the ongoing issues. In October 2014, the DEA rescheduled hydrocodone from a Schedule III to the more restrictive Schedule II substance under the Controlled Substances Act [97]. This move led to prescriptions for hydrocodone decreasing by 22% in the first year after this change was implemented [97,98]. This was followed in October 2016 by the DEA reducing the amount of Schedule II opioid medications that can be manufactured by 25% or more, decreasing the total available supply of these medications [97,99].

Another policy-level intervention that occurred focused on the HCAHPS survey. The 3 questions in the survey related to patient pain control were removed, effective January 2018 [16]. These questions shifted focus from pain control to how well the hospital staff communicates with patients about pain control [16]. This was done to remove the linking of hospital and physician reimbursement with the treatment of a patient's pain, eliminating potential conscious or subconscious opioid prescribing for the sake of maximizing financial return or hospital ratings [16].

In 2012, the FDA responded to the crisis by changing the mandatory labeling for extended-release or long-acting opioids, removing the treatment indication for moderate pain [97,100,101]. Starting in May 2014, the new indication for these medications was for pain "severe enough to require daily, around-the-clock, long-term opioid treatment and for which alternative treatments are inadequate" [97,100]. Other federal interventions were included in the Affordable Care Act, which called for states to develop prescription drug monitoring programs (PDMPs) and increase the funding for substance abuse treatment programs because it was recognized that this issue needed to be addressed from several areas to be successful [97,102].

On July 22, 2016, President Obama signed the Comprehensive Addiction and Recovery Act (CARA), calling for the implementation of incremental steps to combat the opioid epidemic, which expanded access to evidence-based therapies to treat patients who have disorders related to certain opioids, including methadone, buprenorphine, and naltrexone [97,103,104]. This was followed by the signing of the Substance Use Disorder Prevention that Promotes Opioid Recovery and Treatment for Patients and Communities (SUPPORT) Act by President Trump on October 24, 2018. This is designed to assist Medicare in helping states provide coverage and services to people who need substance use disorder treatment, specifically focusing on opioid use disorder, as well as to address law enforcement efforts against illicit drugs and to combat overprescribing of opioids [105–110].

State regulation

Several states have enacted legislation to reduce opioid-related adverse events, with the number of states growing every year. Forty-nine states, plus the District of Columbia and St. Louis County (Missouri) have enacted some form of PDMP regulations, each with specific requirements regarding opioid access and use. Examples of success with this legislative move are New York and

Tennessee, which showed a reduction in patients seeking prescriptions from multiple prescribers by 75% and 36%, respectively [97,111].

Numerous states now require that licensed physicians undergo supplemental opioid prescribing or addiction education for licensure, whereas others require that health care professionals undergo this training if they are responsible for pain management or treating addiction [97,112]. Some states also are now adding medical school teaching requirements to ensure adequate pain management concepts are taught.

Many states now have also added opioid prescription limitations, along with enacting regulations to curtail clinics and prescribers from dispensing these medications from their offices [97]. This started in 2016, with Massachusetts passing the first law in the United States [113]. As of early April 2018, legislation has been enacted in 28 states that had some type of prescription limit, guidance, or requirement related to opioid prescribing [113]. Many of these bills focus on the days of supply; others also included dosage limits, putting exceptions in for certain subsets of patients and not including chronic pain treatments. In the future, more legislation is likely to be enacted to address the ongoing issues.

Surgeon and physician involvement

Numerous medical and surgical organizations are actively engaged with both federal and state legislators, along with regulatory bodies, to ensure that safe practices are implemented and ensuring that these do not hinder the ability of surgeons and physicians to take care of their patients in a comprehensive fashion. Using evidence-based resources to help guide their positions, these groups lobby state and federal officials and provide background and information to help construct reasonable policies that protect patients. Many organizations are developing policies and guidelines with the common goal to diminish the opioid epidemic, including the American Medical Association, which has a Task Force to Reduce Opioid Abuse, using evidence-based strategies to combat the opioid epidemic [97].

Many of the ultimate changes that occurred in the previously mentioned enacted legislation occurred with the input and guidance of surgeons, among other stakeholders. The future direction of this epidemic depends on the efforts of the individual surgeons, advocating for evidence-based legislation that addresses opioid use, not just as individuals but also through their respective state and national professional organizations.

SUMMARY

The opioid epidemic began after an effort to relive pain and over the years has evolved into the current complex health problem. Opioid-related deaths now exceed liver cancer or prostate cancer deaths in the United States [97]. There is still hope that, although the issue with opioid misuse still exists in many ways, through changes in practices, education, and advocacy, the medical community can help remedy the epidemic while still adequately caring for patients.

This requires all surgeons to be involved on numerous fronts, maintaining an understanding of evidence-based practices and incorporating them into their own surgical practice, while cultivating educational opportunities for both the surgeon and the patient, and continuing to advocate for evidence-based legislation to help protect patients but not inhibit the ability to appropriately treat them. The only way for this to be accomplished is if all surgeons participate and work together to implement these changes for the better.

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