OPEN

PRS GLOBAL OPEN

ORIGINAL ARTICLE
Hand

A Retrospective Study Analyzing Opioid Prescription Practices in Hand Surgery from 2013 to 2019

India Rangel, BS
Maya T. Harrington, MBA
Nellie V. Movtchan, MD
Lyndsay A. Kandi, BS
Javier Janbieh, BS
Jordan R. Pollock, MBA
Erwin Kruger, MD
Jason H. Ko, MD, MBA
Chad M. Teven, MD

Background: The potential for opioid prescription medication addiction and abuse has been a growing concern in healthcare. It is not uncommon for hand surgery patients to be overprescribed opioid medication for postoperative pain management. The objective of this study was to characterize changes in opioid prescription practices of hand surgeons treating Medicare Part D patients from 2013 to 2019.

Methods: A retrospective analysis of Medicare Part D prescriber data from 2013 to 2019 was conducted. This database provides information on drugs paid for under the Medicare Part D Prescription Drug Program. For each prescriber and medication, the dataset includes the total number of prescriptions dispensed (original prescriptions and number of refills), and total medication cost.

Results: In 2013, the 10 most common medications prescribed totaled 114,409 prescriptions, with 89,701 (78.4%) opioid prescriptions. In 2019, the 10 most common medications prescribed totaled 164,955 prescriptions, with 109,665 (66.5%) opioid prescriptions. Although total opioid prescriptions dropped, there was a 22% increase in the total number of prescriptions written. The two most common medications prescribed, hydrocodone-acetaminophen and oxycodone-acetaminophen, totaled 75,796 in 2013, compared with 76,518 in 2019. The overall number of prescriptions for nonsteroidal anti-inflammatory drugs increased by 157%, and the percentage of total opioids prescribed declined by 7.9%.

Conclusions: The increase in total opioid prescriptions from 2013 to 2019 by hand surgeons in the Medicare Part D Prescription Drug Program lags behind the recommended shift to nonopioid pain management. The reasons for the overall rise in prescriptions deserve further exploration. *(Plast Reconstr Surg Glob Open 2023; 11:e5218; doi: 10.1097/GOX.0000000000005218; Published online 22 August 2023.)*

INTRODUCTION

In the mid-1800s, opiates were recognized and initially advertised as safe and effective drugs for pain control.[1] Increased use of opiates over the last century allowed for a better understanding of the risks posed by opioid overuse.[2] The first attempt at regulating opioid prescriptions was the 1915 Harrison Anti-Narcotic Act, which imposed a tax on the production, importation, and distribution of opiate and coca products.[3] The first warning labels informing their user of the habit-forming properties of opiates soon followed this act.[4] The Controlled Substance Act of 1970 further placed all substances into one of five schedules (I–V), based upon a substance's medical use, the potential for abuse, and safety or dependence liability.[5]

However, in the 1980s, with the advent of patient-centered medicine, approaches to pain management began to shift, with a push for broader use of opioids in controlling overall pain.[6] This movement in part led in 2001 to the Joint Commission setting new pain management standards that aimed to improve healthcare quality and patient satisfaction.[7] Further, the movement resulted in opioid prescription rates peaking in 2010 at 225 million prescription medications dispensed at a rate of 81.2 prescriptions per 100 people.[8] The overall national opioid dispensing rate declined from 2012 to 2020, and in 2020, the dispensing rate had fallen to its lowest level in 15 years, at 43.3 prescriptions per 100 persons.[9] Although prescription rates began declining in 2012 secondary to attempts

From the Division of Plastic Surgery, Northwestern University Feinberg School of Medicine, Chicago, Ill.

Received for publication May 19, 2023; accepted July 11, 2023.

DOI: 10.1097/GOX.0000000000005218

Disclosure statements are at the end of this article, following the correspondence information.

to reduce opioid use, the death rate from opioid overdose continues to be high.[10]

Opioid use for acute pain is associated with an increased risk of long-term opioid use. With the majority of elective upper extremity surgical cases being performed as outpatient procedures, mainly on the soft tissues, excess opioid analgesics could potentially become a source for diversion, or illegal distribution. The number of opioid pills prescribed after a carpal tunnel release is two to five times more than the average number of pills consumed by the patient.[11] Acknowledging this alarming trend, guidelines for opioid prescriptions after hand surgery have led to a decrease in overprescribing while still attempting to adequately control postoperative pain.[12] However, the effectiveness of these guidelines remains unclear. The objective of this study was to characterize the changes and trends in opioid prescription practices of hand surgeons treating Medicare Part D enrollees from 2013 to 2019.

Takeaways

Question: How have opioid prescription practices of hand surgeons treating Medicare Part D patients changed from 2013 to 2019?

Findings: A retrospective analysis of Medicare Part D prescriber data from 2013 to 2019 was conducted. Total opioid prescriptions dropped, but there was a 22% increase in the total number of prescriptions written. The overall number of prescriptions for nonsteroidal anti-inflammatory drugs increased by 157%.

Meaning: Although nonsteroidal anti-inflammatory drug prescriptions have increased, the increase in total opioid prescriptions from 2013 to 2019 by hand surgeons in the Medicare Part D Prescription Drug Program lags behind the recommended shift to nonopioid pain management.

METHODS

Study Data

A retrospective analysis was performed using the Centers for Medicare and Medicaid Services Medicare Part D prescriber data from all years between 2013 and 2019.[13] This dataset provides information on the medications prescribed by healthcare providers and paid for via the Medicare Part D Prescription Drug Program. This information includes the total number of prescriptions dispensed to each patient—often more than one prescription per patient—as well as total medication cost. The search was limited to 10 of the most common prescriptions written by hand surgeons for patients with Medicare during the timeframe.[14] Few conclusions could be drawn from the drugs that did not make this cutoff, as there were much less data available for these drugs. The data were filtered by provider type to only include prescriptions written by hand surgeons.

Outcomes of Interest

For each year analyzed, prescribed medications were organized by drug class (Table 1), and the claim count and cost was totaled for each drug. Total cost includes the cost of drug ingredients, dispensation fee, taxes, and vaccine administration fees paid by the Medicare Part D plan.[14] Cost per claim was also calculated for these drugs for each year. These calculations were performed separately by two individuals (I.R. and M.H.).

Statistical Methodology

Data were exported from Centers for Medicare and Medicaid Services Medicare Part D—by provider from 2013 to 2019[13] via Microsoft Excel (Microsoft Corp., Redmond, Wash.).[15] These were then organized by drug class, drug name, total claim count, and total drug cost. For each year, the claim count was totaled, as well as the total cost for each drug. Drug claims for each drug type [opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), antibiotics, and steroids] were then totaled, and the percentage of total analgesic prescription by type was calculated. The total cost of opioids and NSAIDs was also calculated. Finally, percentage change in cost per claim was calculated for each drug that appeared in both the 2013 and 2019 top 10 drugs prescribed. All calculations were performed in Microsoft Excel.[15]

Table 1. Classes of Prescription Drugs Analyzed from 2013 to 2019

Drug Name	Drug Class	Claims 2013	Claims 2019
Hydrocodone-acetaminophen	OPIOID	60,397	59,322
Oxycodone-acetaminophen	OPIOID	15,399	17,196
Tramadol Hcl	OPIOID	6267	16,335
Acetaminophen-codeine	OPIOID	4573	9035
Oxycodone Hcl	OPIOID	3065	7777
Meloxicam	NSAID	6409	15,814
Diclofenac sodium	NSAID	4606	12,400
Naproxen	NSAID	2280	N/A*
Ibuprofen	NSAID	N/A*	5958
Methylprednisolone	STEROID	2886	8214
Cephalexin	ANTIBIOTIC	8527	12,904

*Drug was not in top 10 in the year analyzed.

RESULTS

Analgesic Prescription Patterns of Hand Surgeons

In 2013, the 10 most common medications prescribed totaled 114,409 prescriptions, with 89,701 (78.4%) opioid prescriptions. In 2019, the 10 most common medications prescribed totaled 164,955 prescriptions, with 109,665 (66.5%) opioid prescriptions (Table 1). Although there was a drop in the percentage of total opioid prescriptions, there was a 22% increase in the total number written during this period. Hydrocodone-acetaminophen and oxycodone-acetaminophen prescriptions were consistently the top two prescribed drugs, with 75,796 dispensed in 2013 and 76,518 dispensed in 2019. Oxycodone-acetaminophen prescriptions accounted for the slight change during this time period, rising from 15,399 to 17,196, or an 11.7% increase. Hydrocodone-acetaminophen prescriptions

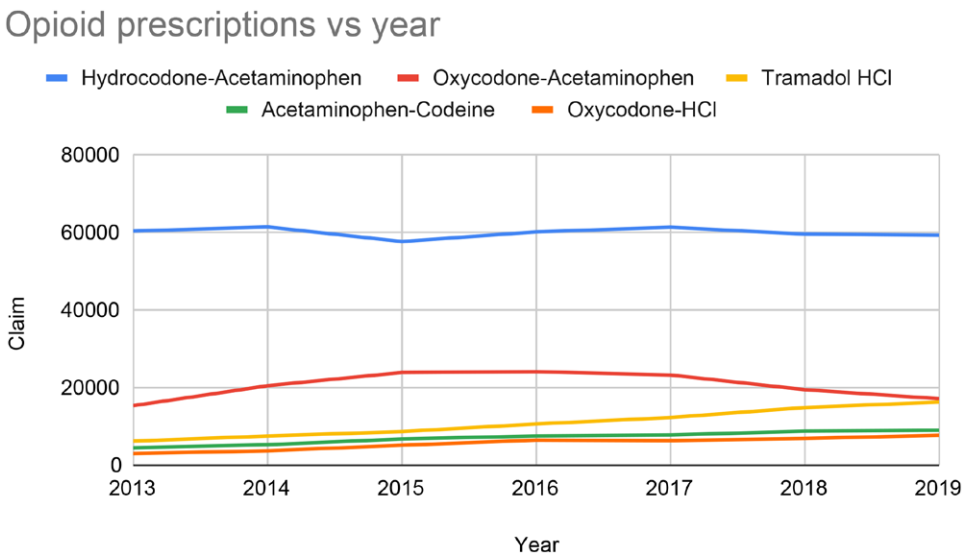

Fig. 1. Number of opioid prescriptions per year, from 2013 to 2019.

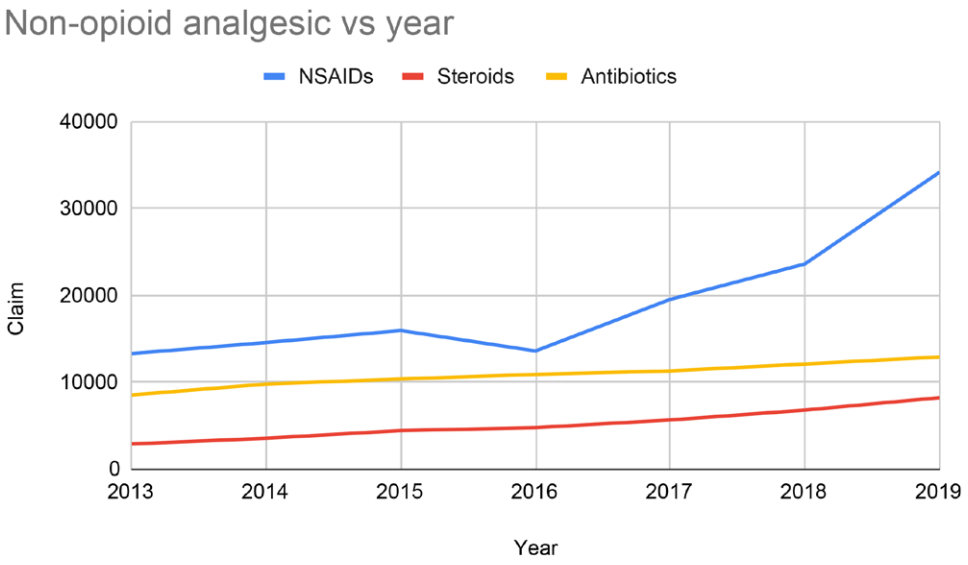

Fig. 2. Number of nonopioid analgesics per year, from 2013 to 2019.

showed a small decrease from 60,397 to 59,322. All other opioid prescriptions increased, the most significant of which was tramadol-HCl, which showed a 161% increase from 6267 to 16,335 (Fig. 1).

Prescriptions of nonopioid analgesics also increased, with a significant rise in NSAIDs seen from 2013 to 2019 (Fig. 2). In 2013, there were 13,295 total claims (11.6% of total top 10 prescription drug claims); in 2019, this number had risen to 34,172 (20.7%). Interestingly, this was due in large part to a spike in prescriptions of diclofenac-sodium, a drug that only had 4606 claims in 2013 but increased to 12,400 claims by 2019. Steroid use, mainly methylprednisolone, steadily increased from 2886 claims in 2013 (2.6%) to 8214 claims in 2019 (5.0%) (Figs. 3 and 4).

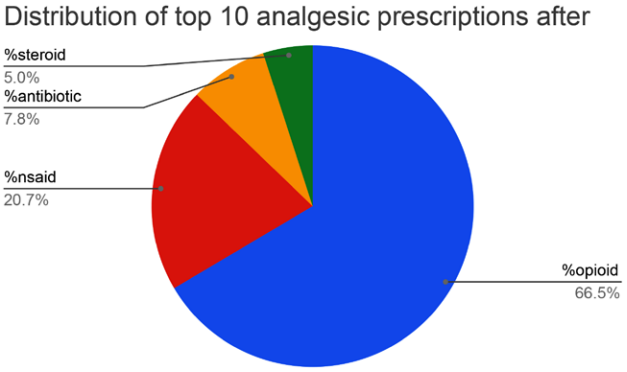

Fig. 3. Distribution of top 10 analgesic prescriptions after hand surgery in 2019.

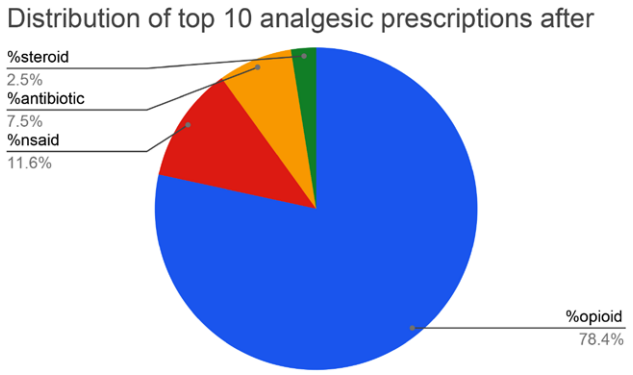

Fig. 4. Distribution of top 10 analgesic prescriptions after hand surgery in 2013.

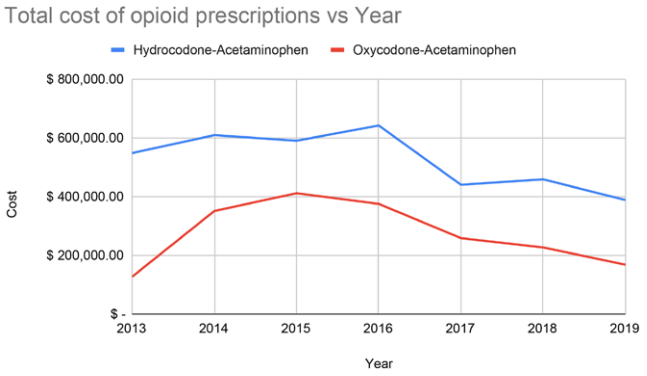

Fig. 5. Total cost of opioid prescriptions per year, from 2013 to 2019.

Opioid Prescription Costs

The cost of hydrocodone-acetaminophen declined despite a stable number of prescriptions. In 2013, the total cost was $548,076 and this dropped to $388,176 by 2019 (Fig. 5), with the cost per claim dropping from $9.07 to $6.54 (27% decrease). The total cost for oxycodone-acetaminophen slightly increased from $127,138 to $167,893 over the same time period, with cost per claim rising from $8.26 to $9.76 (18% increase). The total cost of NSAIDs also increased, from $412,643 to $643,506. However, the cost per claim dropped for the two most prescribed NSAID medications: meloxicam and diclofenac-sodium. Meloxicam started at $6.81 in 2013 and dropped to $4.58 by 2019 (33% decrease), whereas diclofenac-sodium dropped from $76.30 to $42.91 per claim (44% decrease; Table 2).

DISCUSSION

In 2020, 91,799 deaths were related to drug overdose, with 74.8% of these deaths relating specifically to opioid overdose.[16] This is due in part to over-prescription of opioid medications by healthcare professionals.[17] According to a study analyzing opioid disposal practices among hand surgery patients, 78% of patients retained unused opioids, and only 22% disposed of them.[18] Furthermore, larger prescriptions tend to encourage greater opioid use—a randomized control trial performed in 2019 found that after minor hand surgery patients consumed more pills when prescribed 30 hydrocodone-acetaminophen pills compared with 10.[19]

Unfortunately, the number of opioid-related deaths seen in 2020 are in line with the increasing rate of drug overdose–related deaths since 1999.[20] In 2017, this concerning trend prompted the White House to announce the opioid epidemic as a public health emergency.[21] before this announcement, the number of opioid medications prescribed by hand surgeons had been steadily increasing, peaking in 2015 at 82% of prescriptions and dropping slightly over the next two years. In 2018 and 2019, despite the total number of claims holding steady, a decreased percentage of the top 10 analgesic prescriptions were opioids. Nonopioid analgesic prescriptions increased slightly in the years, leading up to the White House announcement but rose more sharply after the announcement. The drop in opioid prescriptions also follows the opioid prescribing guidelines published by the Centers for Disease Control and Prevention in March 2016. The guidelines encourage the prescriber to determine the overall need for opioids; consider their selection, dosage, follow-up, and completion; and assess and address the risks and harm of opioid use with the patient.[22]

This study shows that there is a promising decline in the opioids most commonly prescribed to Medicare patients after hand surgery; however, to maintain this trajectory, it is important to establish concrete plans to continue to address the opioid crisis. One method is to ensure that patients receive adequate education regarding expectations of postoperative pain and its management. A randomized control trial conducted in 2021 found that hand surgery patients used no opioids after minor soft tissue hand surgery if they received adequate education. This education program discussed the expected pain after surgery with emphasis on a tiered system of pain management with focus on nonpharmaceutical modalities of pain relief (rest, ice, elevate), followed by nonopioid

Table 2. Total Cost of Opioid and NSAID Prescription Drugs, Cost per Claim, and Percentage Change in Cost/Claim from 2013 to 2019

Drug Name	Total Cost 2013	Total Cost 2019	Cost/Claim 2013	Cost/Claim 2019	% Change Cost/Claim
Hydrocodone-acetaminophen	548,077	388,176	9.07	6.54	–27%
Oxycodone-acetaminophen	127,138	167,893	8.26	9.76	18%
Acetaminophen-codeine	28,333	40,861	6.20	4.52	– 27%
Oxycodone-Hcl	35,954	45,021	11.73	5.79	– 51%
Tramadol-Hcl	34,129	49,996	5.45	3.06	– 44%
Meloxicam	43,619	72,399	6.81	4.58	– 33%
Diclofenac-sodium	351,433	532,044	76.30	42.91	– 44%

pain medication with opioids used for breakthrough pain. Furthermore, the study found that pain and the number of pills prescribed were the only statistically significant variables associated with increased opioid use.[23]

Likewise, prescriber education and adherence to prescription guidelines significantly decreased the number of pills prescribed per procedure, with one study showing a 52% decrease in prescriptions after a 1-hour opioid education program.[24] A study by Stepan et al showed that preeducation to posteducation number of opioid prescriptions fell to almost half. These studies, however, do not detail who the prescribers are.[25] The aforementioned study also shows that the average and range for carpal tunnel and trigger finger release surgeries were 20 (5–45) and 20 (4–40) opioid pills prescribed, respectively.[25] These numbers of pills prescribed for minor soft tissue surgery are exceedingly high for a surgeon to prescribe. However, with the trend of most orthopedic or plastic surgery hand offices having physician assistants or nurse practitioners perform medication and discharge paperwork reconciliation, it may be enlightening to analyze the effects of operating room exposure and opioid prescription education on prescribing practices of nurse practitioners and physician assistants and compare those with the prescribing practices of the leading surgeons.

With the development of new surgical approaches to limit general anesthesia, there is even greater potential for a reduction in opioid prescriptions. A study conducted in 2021 found that the use of wide-awake, local anesthesia, no-tourniquet (WALANT) hand surgery did not require opioid pain management, and most patients could comfortably manage their pain using NSAIDs alone.[26] WALANT surgery provides for multiple advantages over conventional surgery. This improves the comfort of the patient before surgery eliminating the requirement for *nil per os* and, thus, many preoperative time restrictions. Local anesthetic in combinations with epinephrine is administered by the surgeon in preoperative holding area to allow for epinephrine to take full vasoconstrictive effect, thus negating the need for a tourniquet. Additionally, the patient may participate in a hand examination during surgery, for example to make a fist after A1 pulley release in trigger finger and ensure its full release. Lastly, the use of WALANT negates the need for general anesthesia, thus eliminating its side effects and allowing the patients to recover faster.[27]

Another metric this study analyzed was the change in cost per claim from 2013 to 2019 for each drug. Cost per claim is a measure of the average cost incurred by the hospital to handle the unit cost of a given drug or claim.[28] Of the seven drugs that were compared from 2013 to 2019, six saw a decline in cost per claim but one, oxycodone-acetaminophen, saw an increase. When categorizing individual medications into NSAIDs or opioids, NSAIDs saw a larger average percentage decrease in cost per claim (–39%) compared with opioids (–26%). A decline in cost per claim can be interpreted in various ways, but ultimately suggests fewer costs are being incurred for the hospital organization. Cost may be reduced by a variety of factors, including economies of scale, improved access to claims, cheaper raw resources, and more, but it is unclear what may be driving the trends seen in this study based on the provided data alone.

It is promising to see that there are larger declines in the cost per claim for NSAIDs, as there is an innate incentive to prescribe in a manner that would minimize costs for the organization. When looking closer at the dollar amounts for the cost per unit of individual medications, diclofenac-sodium has a significantly higher cost compared with all the other selected drugs, at $76.30 per unit in 2013 and $42.91 per unit in 2019. Even though it saw a 44% decline in cost per unit, there is more room for improvement in its overall cost per claim. By continuing to reduce the costs of prescribing NSAIDs compared with opioids, there is the potential of creating another avenue of incentive for prescribers to utilize NSAIDs over opioids.

Limitations

There are several limitations to this study. The Centers for Medicare and Medicaid Services database only includes information from those enrolled in Medicare Part D, most of whom are age 65 and older. This excludes patients who have private insurance or self-pay, limiting the generalizability of this study. Additionally, this database does not provide details about the specific procedures performed, or the entirety of patients' treatment regimens. It is unclear how many prescriptions were provided to each patient, as well as the dosages of these prescriptions. The term hand surgeon is also not clarified in this database, and it is unclear if these surgeons were fellowship trained. The database also only includes data from 2013 through 2019, excluding any year before 2013 and the last three most recent years of drug prescriptions under Medicare Part D. It is important to note that when analyzing cost trends, it is difficult to determine to what degree these trends were impacted by inflation.

Future Directions

To continue the trend of decreased opioid distribution after hand surgery, more work is necessary. For example, it would be beneficial to know how costs can affect patient choices regarding pain control, and why the costs of certain prescription drugs have declined or increased. It may also be useful to know how else patients typically choose to treat their pain, as the data from this database do not provide the whole story in terms of their medication regimens. In addition, continued advancements in the world of WALANT surgery may contribute to further decline in the need for pain control via opioids.

CONCLUSIONS

Although the total number of opioid prescriptions by hand surgeons in the Medicare Part D Prescription Drug Program increased from 2013 to 2019, the percentage of opioids in the top 10 total analgesic prescriptions declined. Additionally, NSAID prescriptions increased, both in total number and as a percentage of total prescriptions. This is a promising trend; however, further

analysis of these trends is necessary to work toward a stable, continued decline of opioid prescriptions after hand surgery.

Chad M. Teven, MD
Department of Plastic and Reconstructive Surgery
Northwestern Medicine
1000 N Westmoreland
Lake Forest, IL 60035
E-mail: chad.teven@northwestern.edu

DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

1. Trickey E. Inside the story of America's 19th-century opiate addiction—history. *Smithsonian*. Available at https://www.smithsonianmag.com/history/inside-story-americas-19th-century-opiate-addiction-180967673/. Published 2018. Accessed June 22, 2022.
2. Manchikanti L, Fellows B, Ailinani H, et al. Therapeutic use, abuse, and nonmedical use of opioids: a ten-year perspective. *Pain Physician*. 2010;13:401–435.
3. Terry CE. The Harrison anti-narcotic act. *Am J Public Health (N Y)*. 1915;5:518.
4. Wax PM. Elixirs, diluents, and the passage of the 1938 federal food, drug and cosmetic act. *Ann Intern Med*. 1995;122:456–461.
5. Preuss CV, Kalava A, King KC. Prescription of controlled substances: benefits and risks. In: *StatPearls*. Treasure Island, Fla.: StatPearls Publishing; 2022.
6. Tompkins DA, Hobelmann JG, Compton P. Providing chronic pain management in the "Fifth Vital Sign" era: historical and treatment perspectives on a modern-day medical dilemma. *Drug Alcohol Depend*. 2017;173:(Suppl 1):S11–S21.
7. Meldrum ML. The ongoing opioid prescription epidemic: historical context. *Am J Public Health*. 2016;106:1365–1366.
8. Guy GP, Jr, Zhang K, Bohm MK, et al. Vital signs: changes in opioid prescribing in the United States, 2006-2015. *MMWR Morb Mortal Wkly Rep*. 2017;66:697–704.
9. CDC Injury Center. U.S. prescribing rate maps—drug overdose. Available at https://www.cdc.gov/drugoverdose/maps/rxrate-maps.html. Published November 10, 2021. Accessed June 22, 2022.
10. National Institute on Drug Abuse. Overdose death rates—trends & statistics. Available at https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates. Published 2022. Accessed June 22, 2022.
11. Chapman T, Kim N, Maltenfort M, et al. Prospective evaluation of opioid consumption following carpal tunnel release surgery. *Hand (N Y)*. 2017;12:39–42.
12. Stanek JJ, Renslow MA, Kalliainen LK. The effect of an educational program on opioid prescription patterns in hand surgery: a quality improvement program. *J Hand Surg Am*. 2015;40:341–346.
13. Centers for Medicare and Medicaid Services. Medicare part D prescribers—by provider and drug. Available at https://data.cms.gov/provider-summary-by-type-of-service/medicare-physician-other-practitioners. Published 2020. Accessed June 8, 2022.
14. Kelley BP, Shauver MJ, Chung KC. Management of acute postoperative pain in hand surgery: a systematic review. *J Hand Surg Am*. 2015;40:1610–9, 1619.e1.
15. Microsoft Excel [computer program]. 2018. Redmond, WA: Microsoft Corp.
16. Drug Overdose Deaths Remain High. Available at https://www.cdc.gov/drugoverdose/deaths/index.html. Accessed June 6, 2022.
17. Bedene A, Dahan A, Rosendaal FR, et al. Opioid epidemic: lessons learned and updated recommendations for misuse involving prescription versus non-prescription opioids. *Expert Rev Clin Pharmacol*. 2022;15:1081–1094.
18. Yeung C, Novak CB, Antflek D, et al. Opioid medication disposal among patients following hand surgery. *Hand (N Y)*. 2021;18:701–707.
19. Gaddis A, Dowlati E, Apel PJ, et al. Effect of prescription size on opioid use and patient satisfaction after minor hand surgery: a randomized clinical trial. *Ann Surg*. 2019;270:976–982.
20. Drug overdose deaths in the United States, 1999–2019. Available at https://www.cdc.gov/nchs/products/databriefs/db394.htm. Accessed June 2, 2022.
21. Haffajee RL, Frank RG. Making the opioid public health emergency effective. *JAMA Psychiatry*. 2018;75:767–768.
22. Guideline Overview. Available at https://www.cdc.gov/opioids/providers/prescribing/guideline.html. Published August 6, 2021. Accessed June 6, 2022.
23. Stepan JG, Sacks HA, Verret CI, et al. Standardized perioperative patient education decreases opioid use after hand surgery: a randomized controlled trial. *Plast Reconstr Surg*. 2021;147:409–418.
24. Stepan JG, Lovecchio FC, Premkumar A, et al. Development of an institutional opioid prescriber education program and opioid-prescribing guidelines: impact on prescribing practices. *J Bone Joint Surg Am*. 2019;101:5–13.
25. Stepan JG, Sacks HA, Lovecchio FC, et al. Opioid prescriber education and guidelines for ambulatory upper-extremity surgery: evaluation of an institutional protocol. *J Hand Surg Am*. 2019;44:129–136.
26. Dar QA, Avoricani A, Rompala A, et al. Walant hand surgery does not require postoperative opioid pain management. *Plast Reconstr Surg*. 2021;148:121–130.
27. O'Neill N, Abdall-Razak A, Norton E, et al. Use of wide-awake local anaesthetic no tourniquet (WALANT) in upper limb and hand surgery: a systematic review protocol. *Int J Surg Protoc*. 2020;20:8–12.
28. Cost per claim medical definition & benchmarks. Available at https://opsdog.com/products/cost-per-claim-medical#:%7E:text=Cost%20per%20Claim%20(Medical)%20measures,(i.e.%2C%20unit%20cost). Published 2022. Accessed June 12, 2022.