



Original Article

## Opioid disposal rates after spine surgery

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### ABSTRACT

**Background:** Diversion of prescription opioids pills is a significant contributor to opioid misuse and the opioid epidemic. The goal of this study was to determine the frequency and quantity of excess opioid pills among patients undergoing spine surgery. Further, we wanted to determine the frequency of appropriate opioid disposal.

**Methods:** This was a prospective cohort study of patients undergoing elective spine surgery within a multi-hospital, academic, urban university health system enrolled in a text-messaging program used to track postoperative opioid disposal. Patients who self-reported discontinuation of opioid use but with leftover pills were contacted via telephone and surveyed on opioid disposal.

**Results:** Of the 291 patients who enrolled in the text-messaging program, 192 (66%) patients reported discontinuing opioids within 3 months of surgery. Although 76 (40%) reported excess opioid pills after cessation of use, only 47 (62%) participated in the telephone survey regarding opioid disposal. The median number of leftover pills among these 47 patients was 5 (5, 15) and 64% had not disposed of their prescription.

**Conclusion:** Among the 47 telephone survey participants, a persistent gap remained in postoperative opioid excess and improper disposal. Future efforts must focus on initiatives to improve opioid disposal rates to reduce the quantity of opioids at risk for diversion and to reduce excess prescribing.

**Keywords:** Opioids, Post operative pain, Spine surgery

### INTRODUCTION

The opioid epidemic is a national public health crisis. In 2018, there were 46,802 drug overdose deaths involving opioids in the U.S.<sup>[11]</sup> A majority of people who misuse opioids (71%) obtain their supply through the diversion of an initially appropriately obtained prescription.<sup>[4,10]</sup>

The number of pills prescribed after surgery is often excessive, and leftover pills are at risk for diversion.<sup>[2,3,8]</sup> Investigation into rates of opioid disposal after neurosurgical procedures has been limited to patients undergoing spine surgery.<sup>[7,9]</sup> Here, we attempted to expand on these findings using a prospective, novel, text-messaging system, and survey patients following spine surgery to better understand opioid disposal patterns.

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## MATERIALS AND METHODS

### Study population

We conducted a prospective cohort study of patients undergoing elective spine and peripheral nerve surgery between October 2019 and May 2020.

### Data collection

Patients undergoing elective spine or peripheral nerve surgery were given the option to consent and enroll in a mobile text-messaging program, Way To Health, at their pre-operative clinic visit.<sup>[1]</sup> Participants received automated text messages at 1, 2, and 3 postoperative weeks and 1, 2, and 3 postoperative months. They were asked to respond with their pain levels on a scale of 0 to 10. They were also asked if they were still using opioids to manage their pain, and how many pills they had left.

### FDA recommendations

At each post-operative time point, patients received a one-page pamphlet from the Food and Drug Administration regarding how to safely dispose of excess opioid pills and opioid take-back locations near them. Those who stopped using opioids and had remaining pills were called to answer a four-question survey about when they stopped using opioids after surgery. They were also asked how they disposed of their leftover pills [Appendix A].

### Statistical analysis

Survey data were used to calculate descriptive statistics for the cohort. The primary outcomes were mean (standard deviation [SD]) number of days of opioid use after surgery, median (interquartile range [IQR]) number of remaining opioid pills, and the number of patients who disposed of the remaining pills. For left-over pills, the percentage of various disposal methods and percentage of patients who used the disposal information provided from the text message program was recorded. Plans for use of remaining opioid pills that were not disposed of were also reported.

## RESULTS

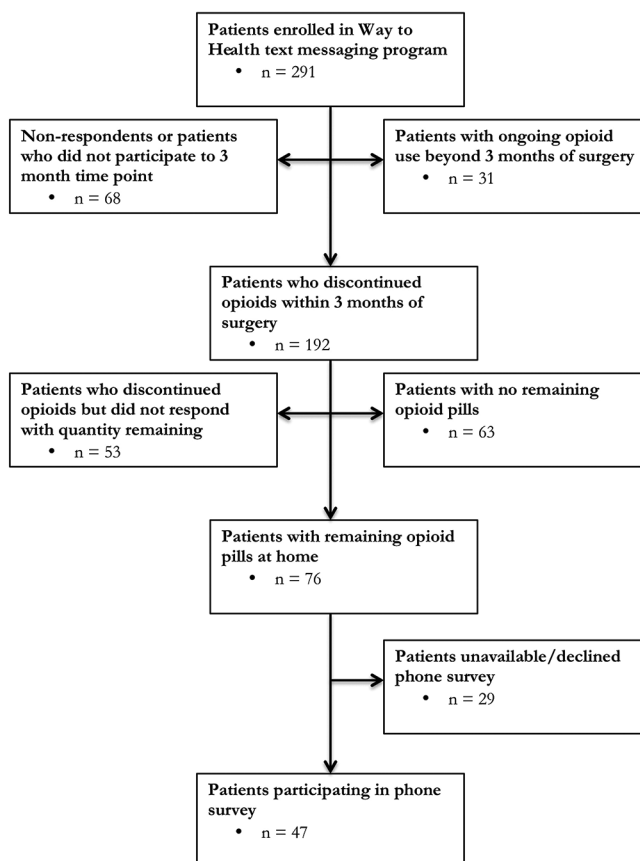
Of the 291 patients enrolled in the Way To Health text-messaging program, 192 had stopped using opioids at one of the post-operative time points. Of the 192, 76 had remaining opioid pills at home, and 47 patients participated in the telephone survey [Table 1 and Figure 1].

The mean length of opioid use after surgery among 44 patients was 8.6 (SD = 8.1, range 0–30 days) [Table 2]. Their median number of leftover opioid pills was 6.5 [IQR 5, 15], and 17 (36.2%) disposed of the excess pills, while

**Table 1:** Characteristics of patients enrolled in Way to Health text messaging program ( $n=291$ ) and phone survey participants ( $n=47$ ) with excess opioid pills following spine surgery at Pennsylvania Hospital, Penn Presbyterian Medical Center, and Hospital of the University of Pennsylvania between October 2019 and May 2020. Exclusion criteria included urgent or emergent cases and patients who declined to enroll in the texting program.

Characteristics	Way to Health participants ( $n$ [%])	Phone survey participants ( $n$ [%])
Age* (year)	60.3±13.1	61.8±12.1
Female sex	115 (39.5)	20 (42.6)
White race	249 (85.6)	45 (95.7)
BMI*	30.4±5.4	29.7±4.6
Pre-operative narcotic use	95 (32.6)	7 (14.9)
Surgery		
ACDF	34 (11.7)	2 (4.3)
Thoracolumbar laminectomy	100 (34.3)	17 (36.2)
Thoracolumbar fusion	86 (29.6)	15 (32.0)
Cervicothoracic laminectomy±fusion	30 (10.3)	7 (14.9)
Peripheral nerve surgery	14 (4.8)	2 (4.3)
Other †	27 (9.2)	4 (8.5)

\*These values are given as the mean and standard deviation. †Other category includes spinal cord stimulator placement, spinal cyst resection, and benign spinal schwannoma resection, BMI: Body mass index



**Figure 1:** Study sample.

**Table 2:** Opioid use and disposal patterns among phone survey participants ( $n=47$ ) with excess opioid pills following spine surgery.

	Mean (SD), Median (IQR), No. (%)
Mean length of opioid use (d)	8.6 (8.1)
Median number of excess opioid pills	6.5 (5, 15)
Number of patients who disposed of pills	17 (36.2)
Appropriately in household trash	9 (52.9)
Returned to disposal site	8 (47.1)
Number of patients who kept pills	30 (63.8)
Did not plan to use	28 (93.3%)
Planned to use in future pain “flare up”	2 (6.7%)

30 (63.8%) kept the excess opioid pills at home [Table 2]. For the 17 who disposed of excess pills, 9 (52.9%) disposed of the pills appropriately in the household trash and 8 (47.1%) brought their pills to an appropriate disposal site [Table 2]; 5 (29.4%) used the FDA information regarding safe opioid disposal (included in text message program).

Of the 30 patients who did not dispose of their excess opioid pills, 28 (93.3%) did not plan to take the pills in the future, while 2 (6.6%) reserved these for future use (i.e., pain flare-ups).

## DISCUSSION

In this cohort of patients who underwent elective spine or peripheral nerve surgery, only a minority of patients (36.2%) disposed of their excess opioid pills appropriately. In an earlier study, Lovecchio *et al.* found that only 21.1% of patients who underwent lumbar surgery disposed of excess opioids appropriately.<sup>[7]</sup> Bicket *et al.* found that no study of opioid use after surgical procedures had an opioid disposal rate of greater than 9%.<sup>[3]</sup> The rate of disposal in our study was higher likely due to providing patients with FDA-approved safe disposal information.

The median number of excess pills was 6.5 in the current study. This value is lower than the number of leftover pills found in most prior studies of post-surgical patients.<sup>[2,8,9]</sup> Sabatino *et al.* found that patients undergoing lumbar surgery had an average of 29 leftover opioid pills.<sup>[9]</sup> The use of prescription guidelines has successfully reduced overprescribing of excess pills in general surgery.<sup>[5,6]</sup>

## CONCLUSION

We found that among patients who engaged in our text-messaging platform, roughly one-third of patients disposed of excess opioid pills in an appropriate manner after elective spine surgery. Future efforts must focus on patient education and institutional initiatives to improve opioid disposal rates,

and reduce the amount of opioids prescribed following neurosurgical procedures.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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## Conflicts of interest

There are no conflicts of interest.

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1. According to your response to the ERAP text messages, you stopped taking opioids to manage your pain. Is that correct?  
 Yes  
 No
2. How long after surgery did you stop taking opioids?  
\_\_\_\_\_
3. According to your response to the ERAP text messages, you had about \_\_\_\_\_ pills leftover. Is that correct?  
 Yes  
 No
4. Did you dispose of the remaining opioid pills?  
 Yes
  - a. How did you dispose of the leftover pills?  
 Disposed appropriately in household trash  
 Brought to an appropriate drug disposal site  
 Don't recall  
 Other: \_\_\_\_\_
  - b. Did you use the safe opioid disposal information on our website that we provided you a link to?  
 Yes  
 No
  - c. Did you use the link for finding appropriate drug disposal sites near you that we provided you with?  
 Yes  
 No No
  - d. What did you do with the remaining opioid pills?  
\_\_\_\_\_

**Appendix A:** Telephone survey script.