

# Characteristics of Opioid Prescribing in Non-surgical Medicine Patients with Acute Pain at Hospital Discharge



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**BACKGROUND:** The opioid epidemic and new Joint Commission standards around opioid stewardship have made the appropriate prescribing of opioids a priority. A knowledge gap exists pertaining to the short-term prescription of opioids at hospital discharge for acute pain in non-surgical patients.

**OBJECTIVE:** To characterize the quantity, type, and indication of opioids prescribed for non-surgical patients on hospital discharge and subsequent patient utilization.

**DESIGN:** This multicenter, single-health system retrospective cohort study was conducted for quality improvement purposes from December 2019 to May 2020 with patient follow-up 15 to 29 days after hospital discharge.

**PARTICIPANTS:** Patients discharged from a medicine service with new opioid prescriptions, defined as no opioid prescription documented within the past 90 days, were identified as eligible through the electronic health record. Surveys were attempted until a total of 200 were completed, with 374 surveys attempted and a 53% response rate.

**INTERVENTION:** Patients were contacted via phone and surveyed post-discharge. Surveys consisted of 28 questions and assessed opioid consumption, duration of use, refills, patient satisfaction, and opioid disposal.

**MAIN MEASURES:** Prescribing indications and morphine milligram equivalents (MME) quantities were collected for patients at discharge. Subsequently, the quantity of prescribed opioids utilized, remaining, and disposed of post-discharge were collected via patient self-reported survey responses.

**KEY RESULTS:** Indications for opioid prescribing for 200 surveyed patients were grouped into eight broad prescribing categories. A median of 112.5 total MME was prescribed to patients at hospital discharge. Median MME consumed for surveyed patients was 45. The median total MME remaining at time of survey was 35 MME. Only 5.9% of patients who had leftover opioids reported disposal of the medication.

**CONCLUSIONS:** Given the observed variation in opioid prescribing and utilization data, standardized indication-based opioid prescribing guidance in the non-surgical medical population would help curb the amount of opioids that remain unused post-discharge.

**KEY WORDS:** opioids; hospital discharge; acute pain; internal medicine; prescribing.

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## INTRODUCTION

In the USA, there were approximately 400,000 deaths due to opioid overdose between 1999 and 2017.<sup>1</sup> The first wave of the current opioid crisis correlated with large increases in the number of prescription opioids prescribed to patients in the mid-1990s.<sup>1</sup> Even after years of work to combat the crisis, in 2018 an estimated 41 Americans died each day from an opioid overdose, largely due to the use of synthetic opioids such as fentanyl.<sup>2</sup> While the opioid epidemic has evolved, curbing of opioid prescribing remains critical due to the noted association between short-term prescription opioid use and the risk for prolonged opioid use and the development of substance use disorder.<sup>3,4</sup> The probability of persistent long-term opioid use increases most significantly with 5 to 8 days of initial opioid use.<sup>5</sup> Risk of adverse effects and opioid overdose increase based on daily MME prescribed, with a nine-fold increase in overdose risk for individuals prescribed over 100 MME/day as compared to individuals prescribed less than 50 MME/day.<sup>6</sup> The persistent opioid epidemic and new opioid stewardship standards instituted by Joint Commission have made the appropriate prescribing of opioids a priority in institutions nationwide.<sup>7</sup> Fifteen states have passed legislation limiting opioid prescribing for acute pain in opioid-naïve patients to a 7-day supply, and over half of all states have instituted some type of prescribing limit for acute pain.<sup>8</sup> However, limits for day supply do not always have the desired effect of reducing the total quantity of opioids commonly prescribed.<sup>9</sup>

Opioids prescribed in the setting of acute pain can lead to chronic opioid use.<sup>10–13</sup> Emergency department and surgical services have been a central focus of efforts to limit opioid prescribing due to their significant roles in acute pain management. Studies characterizing opioid utilization following surgical procedures and emergency department visits have informed institutional prescribing.<sup>14–18</sup> There is a gap in studies characterizing opioid utilization from non-surgical

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medicine services, and guidelines that do exist for this population are based on expert consensus instead of utilization information.<sup>19–21</sup> A large knowledge gap regarding short-term prescription of opioids at hospital discharge leaves open a need for opioid utilization assessments and optimization of opioid prescribing protocols in the setting of non-surgical patients. Non-surgical patients are defined as patients admitted for medical purposes that did not undergo a surgical procedure during hospitalization. This study aims to characterize the quantity, type, and indication of opioids prescribed for non-surgical patients on hospital discharge and quantify patient experience with opioid utilization post-discharge.

## METHODS

This retrospective cohort study undertaken for quality improvement purposes includes inpatients from across a multi-state health system. Patients were eligible if discharged with a new opioid prescription for hydromorphone, oxycodone, hydrocodone, morphine, or tramadol between December 13, 2019, and April 10, 2020. Patients were identified through use of the electronic health record and were screened for inclusion if they were a non-surgical medicine patient who received an opioid prescription on discharge from one of 17 hospitals across four states (MN, WI, FL, AZ). Patients on inpatient hospital medicine services including internal medicine, family medicine, cardiovascular disease, pulmonary medicine, gastroenterology and hepatology, neurology, and nephrology were eligible for inclusion. Non-surgical trauma patients admitted to internal medicine services were also included. Patients were excluded if they were less than 18 years of age, discharged to hospice, had a diagnosis for cancer with active treatment, had refused Minnesota authorization for research, or had recent opioid use, defined as receiving an opioid prescription within the 90 days prior to their inpatient visit as indicated by admission and discharge medication lists.

After screening for inclusion, patients were contacted by the Mayo Clinic Survey Research Center (SRC) approximately 2 to 4 weeks after hospital discharge for surveying. A 28-question survey was developed in collaboration with the SRC based on previous patient opioid utilization surveys completed at our institution to assess total opioid consumption, duration of opioid use, refill needs, patient satisfaction, use of alternative pain control strategies, and opioid disposal (Supplemental 1).<sup>22</sup> This initiative was conducted for quality improvement and deemed exempt by the institutional review board (IRB). The SRC reviewed questions to ensure they were written at an appropriate reading level and phrased to ensure patient understanding and obtained verbal consent from patients prior to initiating the survey. Surveys were completed between January 6, 2020, and May 1, 2020, with plans to survey 2 to 4 weeks after eligible patients were discharged. Eligible patients were identified on a rolling basis, and surveying was conducted until a total of 200 surveys were

completed. All patient surveys were completed within 15–29 days of discharge, with a median time from discharge to survey completion of 21 days (IQR 18–23). Overall attempts were made to contact 374 eligible patients, with a survey response rate of 53% upon final completion of 200 surveys.

Patient demographics were collected for surveyed patients utilizing manual chart review. Past medical history, discharge disposition, health system location, indication for opioids, and inpatient length of stay were collected. Indication for opioid prescription was grouped into eight broad categories (abdominal, post-procedural, chest pain, back pain, joint pain, trauma pain, kidney pain, and other) by consensus of three authors (KE, CSB, and JC) after review of the hospital discharge diagnoses from electronic health record documentation. Additionally, opioid data for each patient was collected, including prescribed discharge opioid, dose, quantity, total prescribed morphine milligram equivalents (MME), maximum MME per day per prescription directions, prescriber specialty, and the total opioid MME dose administered in the 24 h prior to discharge.

Among the patients who responded to the survey, descriptive statistics were used to compare demographics, patient characteristics, opioid prescribing, utilization, and patient satisfaction by indication for opioid prescription. Total opioid prescription was characterized as continuous total MME as well as grouped by quantities of < 100 MME, 100–200 MME, and > 200 MME. Continuous factors, including total MME prescribed and duration of opioid utilization, were described using mean and standard deviation for normally distributed factors and median and interquartile range for non-parametrically distributed factors. Quantity and percentages described discrete factors including grouped MME (< 100 MME, 100–200 MME, > 200 MME), opioid type, indication for opioids, disposal of leftover opioids, patient satisfaction with pain control, use of non-opioid medications, and refills. Continuous factors were compared using Wilcoxon rank-sum, Kruskal-Wallis, and t-tests while categorical factors were compared using chi-square and Fisher's exact tests. A Kaplan-Meier analysis analyzed duration of opioid use, with the event defined as the patient-reported day at which utilization stopped after discharge. If a patient did not report duration of opioid use, they were designated as zero-consumers and assigned a duration of opioid use of zero days. Patients still taking opioids were censored on the date of survey. Statistical analysis was performed using SAS version 9.4 (SAS Institute Inc., Cary, NC). All *p*-values were considered statistically significant at *p* < 0.05.

## RESULTS

There were 3188 patients screened for inclusion. The majority of patients (60.2%) were excluded due to opioid prescription within the previous 90 days. Overall 374 patients were deemed eligible for inclusion and contacted by the survey

research center. There was a response rate of 53% and the goal of 200 completed patient surveys was met (Fig. 1). All 200 patients with completed surveys were included for analysis. Overall 54% of patients surveyed were female, with a median age of 61 years (IQR 50–72). The median hospital length of stay was 3 days (IQR 2–4). Additional demographic data can be found in Table 1.

A majority of patients in this study (80%) were discharged from hospital internal medicine (Table 1). Across all patients, the median total MME prescribed was 112.5 (IQR 60–167.5) with a median of 45 (IQR 10–104) MME consumed following discharge. This resulted in a median of 40% of prescribed MME remaining unused at the time of survey. The top indications for prescribed opioids were medical issues causing abdominal pain (24%), trauma-related pain (17%), and joint pain (14%) (Fig. 2). The most commonly prescribed opioid was oxycodone (61% of prescriptions), followed by tramadol (22% of prescriptions). The three indications with the highest total MME prescribed were kidney pain (median 225 MME, IQR 108–315), trauma pain (median 150 MME, IQR 113–200), and back pain (median 150 MME, IQR 80–228). The lowest total MME was prescribed for patients receiving opioids for the indications of chest pain (median 60 MME, IQR 60–135). Only 3 patients were prescribed more than one type of opioid on discharge. Three patients elected to not fill their opioid prescriptions. There was no significant association between MME consumed in the 24 h prior to hospital discharge and the total prescribed MME as seen in Figure 3

( $R^2=0.1251$ ). Based on the survey results, 21.9% of patients utilized all opioid medication prescribed to them on discharge.

The median total MME consumed, MME remaining, and percent of opioids remaining are presented in Table 2 by indication. There was substantial variation in prescribing quantities within indication, where most indications had an interquartile range greater than 100 MME (Table 2). Table 3 examines the percentage of patients prescribed < 100, 100–200, and  $\geq 200$  MME of opioids by indication. Significant variation in quantities of prescribed opioids was found between indications ( $p=0.002$ ). There were non-significant differences by indication for duration of opioid use, total MME consumed, unused opioid MME remaining, and opioid disposal practices.

On the basis of Kaplan-Meier analysis, the median cessation to opioids after discharge was 4 days (IQR 4–6) (Fig. 4). The indication with the longest duration of use was trauma-related pain with a median duration of use of 6.5 days. The indication with the shortest duration of use was back pain with a median duration of 2.5 days. Of the 200 patients surveyed, 20.9% of patients were still currently using opioids and 17.5% had required additional prescriptions for opioids. Of the 35 patients (17.5%) who reported needing refills, 20% reported significant difficulties in obtaining additional pain medication. There were no significant differences in the need for refills between various indications ( $p=0.14$ ).

Eight patients (5.0%) with leftover medication had disposed of their leftover opioids. Two patients threw their medication

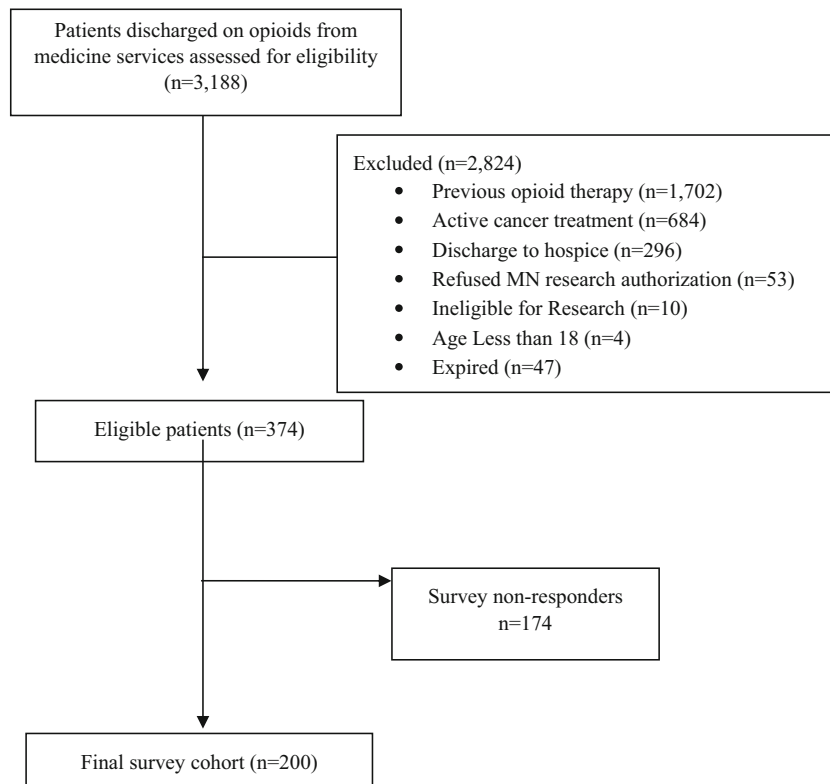


Fig. 1 Consort diagram describing inclusion and exclusion information for screened patients.

**Table 1 Demographic Characteristics**

Age (median years (IQR))	61 (50–72)
Sex (n (%))	
Female	108 (54)
Days from discharge to survey (median (IQR))	21 (17–23)
Race/ethnicity (n (%))	
Caucasian	187 (94)
African American	8 (4)
Asian	4 (2)
Hispanic	1 (1)
Hospital length of stay (median days (IQR))	3 (2–4)
Location (n (%))	
Rochester	78 (39)
Minnesota Health System	37 (19)
Wisconsin Health System	48 (24)
Arizona	19 (10)
Florida	18 (9)
Prescribing service (n (%))	
Hospital internal medicine	160 (80)
Nephrology	12 (6)
Gastroenterology and hepatology	9 (5)
Family medicine	8 (4)
Cardiovascular disease	8 (4)
Pulmonary medicine	2 (1)
Neurology	1 (1)
Discharge disposition (n (%))	
Home	182 (91)
Skilled nursing facility	10 (5)
Subacute rehab facility	7 (4)
Acute care hospital	1 (1)
Mental health history (n (%))	
Depression only	26 (13)
Anxiety only	12 (6)
Both depression and anxiety	32 (16)
Neither	130 (65)
Smoking status (n (%))	
Never	108 (54)
Former	60 (30)
Current	32 (16)
History of substance use (n (%))	
Yes	25 (13)
No	175 (88)

IQR interquartile range

History of substance use: defined as history of chronic utilization of alcohol, stimulants, cannabis, or illicit drugs

n = 200

out, one flushed it down a toilet, three took it back to a pharmacy or police station, and two utilized a commercial drug disposal bag. Of patients reporting no current opioid usage, 51.3% (n=96) had kept their remaining opioid supply. Patient education on proper disposal of leftover opioid medication was not assessed.

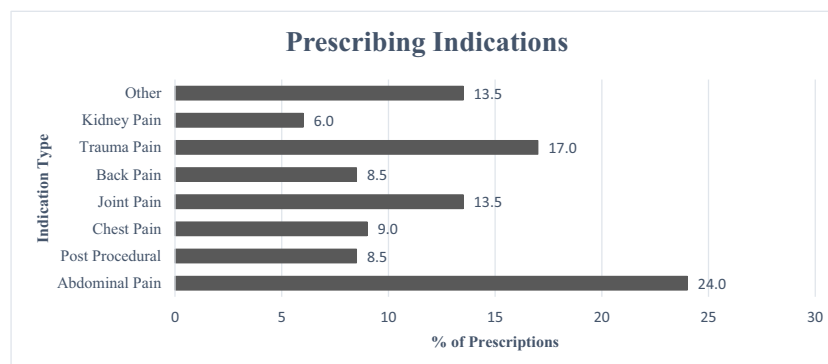
Patient satisfaction with their pain management was fairly high with 57.8% of patients reporting excellent satisfaction. The median pain control score post-discharge was seven out of ten (zero being pain not at all controlled and ten being pain completely controlled). In self-reporting, 12.1% of patients felt that they had been given too much pain medication, 16.8% of patients reported they had not been given enough pain medication, and the remaining 71.1% of patients indicated they felt they had been given the appropriate amount of pain medication.

With regard to non-prescription pain medications, 79.9% of patients reported taking some type of over-the-counter pain medication in addition to their opioid prescription, with 59.8% of patients taking acetaminophen, 6.5% using ibuprofen, and 12.1% using multiple over-the-counter medications. In regard to non-pharmacological pain management strategies, 44.2% of patients reported utilizing some form of alternative pain management, with the most common strategy being hot-cold therapy (36.7%).

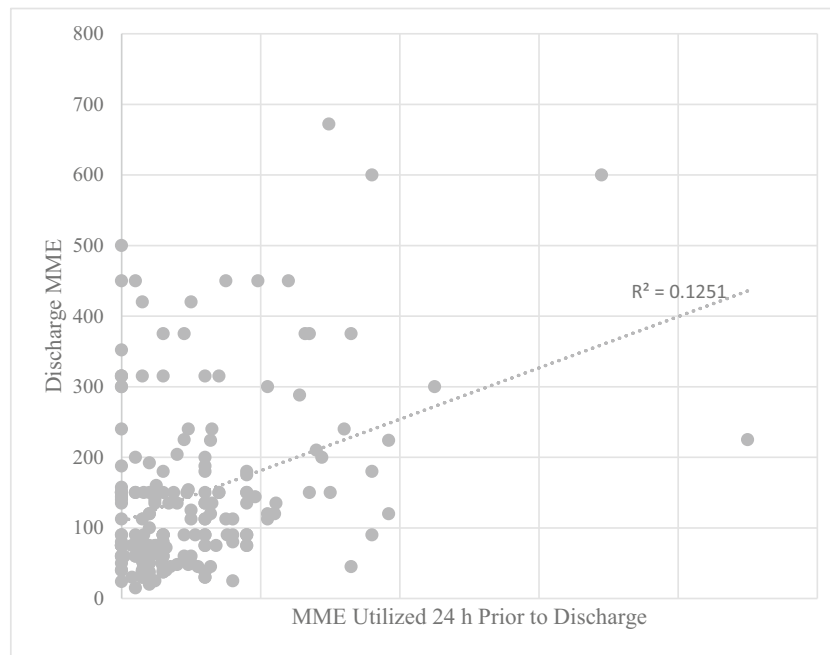
## DISCUSSION

The results from this retrospective cohort study indicate that there is room for standardization and reduced opioid prescribing among non-surgical medical services in the hospital setting. With substantial variation in prescribing within indications and high quantities of opioids remaining at the time of the survey, it appears that opioid prescribing can be optimized for patients with various discharge diagnoses. Although the Center for Disease Control and Prevention (CDC) guideline provides blanket recommendations to limit short-term prescribing of opioids for acute pain, applying broad recommendations to specific patient populations can be difficult and lead to a lack of opioid optimization.

There is little current literature examining short-term opioid prescribing among adult non-surgical patients for acute pain in the hospital setting. Non-surgical indications for opioids have been examined in the primary care setting, where prescribing has been found to deviate from guidelines although 7-day opioid supplies are sufficient for the large majority of patients.<sup>23,24</sup> Two studies in pediatric acute care settings found



**Fig. 2** Distribution of general prescribing indications for surveyed patients.



**Fig. 3 Comparison of hospital use and discharge opioid prescribing. Correlation between opioid morphine milligram equivalents (MME) utilized 24 h prior to discharge and total prescribed MME.**

that 4 days of opioids was adequate to treat pain among both surgical and non-surgical patients, and noted significant over-prescribing based on utilization analysis.<sup>25,26</sup> A recent systematic review examined harms of opioid prescribing on hospital discharge among both surgical and non-surgical patients and found that only 38% of prescribed opioids were utilized.<sup>27</sup> In our study examining only non-surgical medical patients, approximately 60% of opioids were utilized at the time of survey, demonstrating higher utilization than in the combined systematic review population but a large number of opioids still going unused. This number, however, represents progress in opioid stewardship principles to right size prescription quantities. The review found that 3 months after discharge, 10.4% of patients were still utilizing opioid medications, and although our study did not reexamine utilization this far out from hospital discharge, 20.9% of patients reported they were still using opioid medication 15 to 29 days after discharge in our study.<sup>27</sup>

A recent retrospective multicenter survey study examining opioid prescribing and utilization for patients undergoing select surgical elective procedures found that approximately 91% of surveyed participants received an opioid prescription on hospital discharge, and of this population the median total MME prescribed was 225. At the time of post-discharge surveying, a median of only 43 MMEs had been utilized, leaving approximately 61.5% of prescribed opioids unused. Overall 77.3% of patients had leftover opioids at time of surveying, and 31.4% had used no opioids. Less than 10% of surveyed patients reported disposing of leftover opioids after they had ceased using them postoperatively. The results of that study allowed for the development of a postoperative prescribing guideline implemented based on individualized procedures to optimize opioid prescribing which significantly reduced variation in prescribing and total quantities.<sup>14,22</sup> The prescribing and utilization results from that study are comparable to what was observed in our study, with low disposal

**Table. 2 Opioid Prescribing and Utilization by Indication**

Indication	MME prescribed (median, IQR)	MME consumed (median, IQR)	MME remaining (median, IQR)	% remaining (median, IQR)
All	112.5 (60–167.5)	45 (10–104)	35 (0–90)	40 (0–86.7)
Abdominal pain	90 (56.3–130)	42.5 (7.5–90)	32.5 (0–77.5)	48.8 (0–89.5)
Post-procedural pain	75 (60–900)	22.5 (15–52.5)	37.5 (15–75)	41.7 (30–88.9)
Chest pain	60 (60–135)	24 (5–60)	30 (19.5–60)	50 (29.2–91.7)
Joint pain	112.5 (60–175)	48 (25–90)	30 (0–160)	28.6 (0–60)
Back pain	150 (80–288)	48 (20–150)	0 (0–130)	0 (0–83.3)
Trauma pain	150 (112.5–200)	60 (10–150)	60 (0–105)	52 (0–93.3)
Kidney pain	225 (107.5–315)	90 (37.5–165)	50 (0–150)	35.7 (0–85.7)
Other pain	75 (75–150)	67.5 (16.3–75)	33.8 (0–75)	36.7 (0–89.2)

*IQR interquartile range*



Table 3 Opioid Prescribing Quantities by Indication

Opioid quantity	Abdominal (n=48)	Post-procedural (n=17)	Chest (n=18)	Joint (n=27)	Back (n=17)	Trauma (n=34)	Kidney (n=12)	Other (n=27)	Total (n=200)
Less than 100 MME	62.5%	76.5%	61.1%	48.1%	29.4%	23.5%	25.0%	59.3%	49.5%
100–200 MME	27.1%	23.5%	27.8%	29.6%	35.3%	52.9%	25.0%	18.5%	31.0%
> 200 MME	10.4%	0.0%	11.1%	22.2%	35.3%	23.5%	50.0%	22.2%	19.5%

MME morphine milligram equivalents

rates of leftover medication, low amounts of opioid medication used following discharge, and a higher amount prescribed compared to our study.

Other studies have examined the correlation between post-discharge opioid use and hospital use 24 h prior to discharge to develop prescribing guidelines.<sup>16</sup> In this study, MME utilized in the 24 h prior to discharge was assessed, and no correlation was observed between utilization and total MME prescribed.

Significant prescribing variation was noted between indications in our study, which is to be expected based on the differences in expected pain severity and duration. However, it is important to note that variation also exists in prescribing quantities within indications. The IQR for post-procedural indications was extremely wide at 60–900 MME, with the largest differences observed for kidney pain (107.5–225 MME) and back pain (80–288 MME). Examining these patterns of opioid prescribing quantity and associated excess

remaining medication suggest several potential areas of optimization. There is evidence for surgical populations that multidisciplinary intervention can reduce opioid prescribing quantities on hospital discharge without increasing patient demand for refills.<sup>28</sup> Similar to this study, a proposed prescribing guideline can be created by a multidisciplinary team and incorporated into institutional practice. Based on the results of our study, the reported median total MME and IQR data on the amount of opioids consumed could be utilized to create recommended prescribing ranges for specific indications as the recommended standard prescribing amount. Larger amounts should be considered for patients demonstrating higher hospital opioid utilization and a recommendation for patients likely to be higher users could be based on the 3<sup>rd</sup> quartile of the consumption data (Table 2).

Patient disposal of opioids after they discontinue use remains suboptimal. A meta-analysis examining opioid

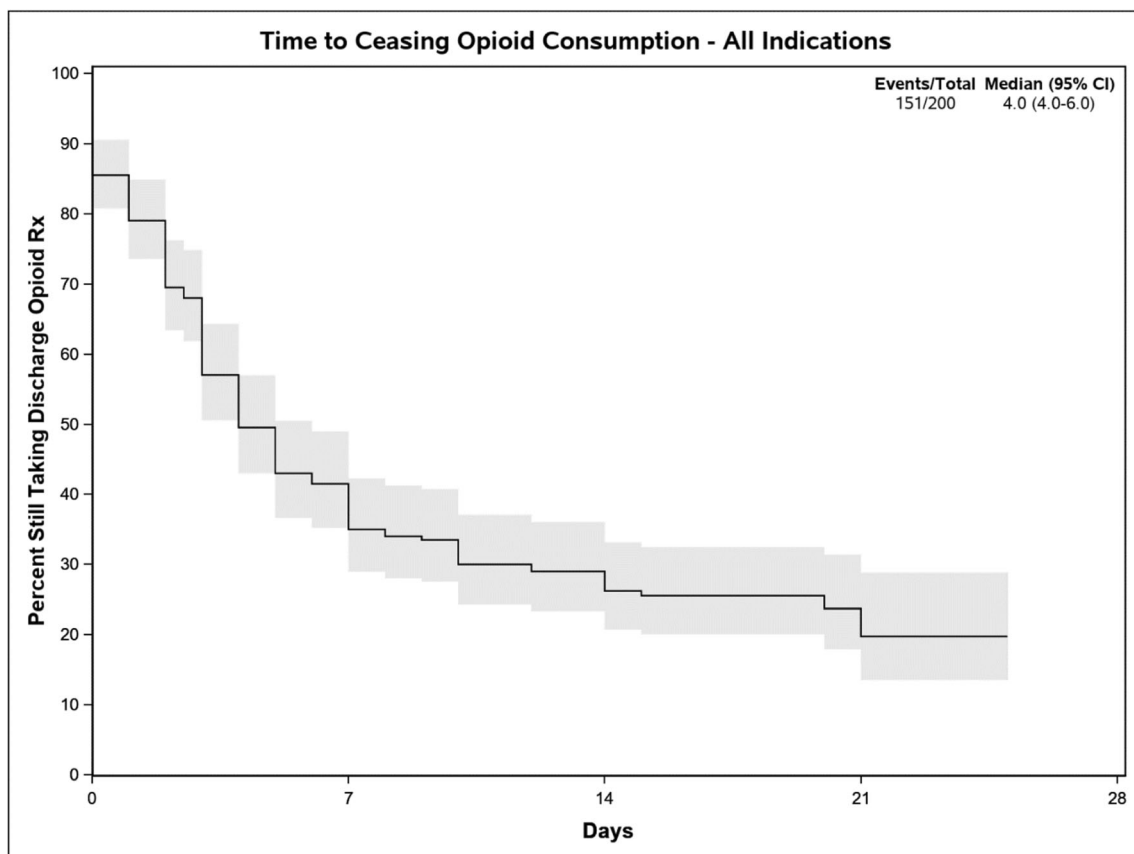


Fig. 4 Kaplan-Meier curve demonstrating time to cessation of opioid use after discharge for all indications.

disposal found no studies that reported disposal rates greater than 10%, and additional studies found similar rates of disposal.<sup>14,29,30</sup> The previously mentioned meta-analysis investigating opioid utilization also found that approximately only 4% of patients properly dispose of opioids.<sup>27</sup> Our study found similar results with only 5% of patients disposing of leftover opioids. Although education regarding opioid disposal has been incorporated into general counseling around opioid use, our results suggest that further work needs to be done by health care providers who play a pivotal role in discussing potential routes of opioid disposal. While we did not assess for patient knowledge regarding how to dispose of opioids, the proposed opioid prescribing guideline should emphasize the need to provide patients with this information on discharge.

Utilization of non-opioid pain medications was commonplace among our surveyed population, which supports opioid sparing prescribing. Enhanced recovery pathways from surgical practices have established the importance of multimodal pain control.<sup>31,32</sup> Non-pharmacologic methods for pain management including hot-cold therapies were reported among the survey population as well. Overall, our results show that the continued emphasis among health care professionals on multimodal pain management strategies has translated well to patient care.

Patient satisfaction was relatively high, showing that generally prescribing of opioids has been adequate to meet patient needs. Most patients who needed refills on opioids did not note any significant barriers to receiving additional opioids. The majority of patients noted that they felt the amount of opioids prescribed to them was just right, despite there being a documented excess of unused opioids. A large potential barrier to instituting guidelines is patient perception of adequate pain control; however, implementations of prescribing guidelines have not shown increases in refill requests or reduced patient satisfaction.<sup>12,14</sup> If a prescribing guideline were to be put into place, a follow-up survey to assess continued high patient satisfaction would likely need to be undertaken as a counterbalance measure.

There are a number of limitations of our study that warrant discussion. One limitation is that it is likely too small in scope to recognize meaningful prescribing differences among specific indications within each category. Due to the multitude of confounding factors and small sample size, we were unable to perform an adjusted analysis to assess for significant differences in opioid prescribing and utilization. Due to the institution of new opioid prescribing guidelines for acute pain by the CDC and individual states, prescribing is likely to be more homogenous than that described in previous opioid studies. However, that is not to say that the information found is not valuable in assessing specific areas where opioid utilization can be optimized beyond existing general guidelines. A second limitation of our study is that all patients were assessed within one health system. Although patients were located across four states, patient populations in our institution may vary from those seen by other medicine providers across

the country. A third limitation of our study is that previous opioid users were identified by comparing admission and discharge medication lists to assess for new opioid prescriptions. A more accurate manner in which to screen for opioid use within the 90 days prior to discharge would have been through utilization of the state prescription drug monitoring program (PDMP). However, due to limitations on utilization of PDMP information for research purposes, we instead relied on the accuracy of our institutional electronic health record in identifying previous opioid users. A fourth limitation is the opioid amount remaining was self-reported on survey and exact numbers of remaining opioid pills may not be an accurate representation. Additionally, the window for surveying ranged from approximately 2 to 4 weeks, and patients who were contacted earlier in the window may have had higher quantities of medication left. The large time frame for survey may have introduced survivorship bias, skewing the results that were ascertained for quantities remaining.<sup>27</sup> Another limitation was response bias for patients who were discharged to facilities. While patients discharged to skilled nursing and subacute rehab facilities were eligible for inclusion in our study, the SRC reported they were unable to reach a significant number of these patients. Difficulties in contacting this patient population may have biased our results and limited generalizability to home-going patients. A final limitation is that experience of the prescribing physicians varied considerably and included hospitalists, nurse practitioners, physician assistants, and medical residents. Differences in experience could influence safe prescribing practices and the provision of discharge opioid counseling. These differences were not assessed or taken into account in our study.

Despite the above limitations, our relatively large sample size and survey research center expertise and involvement support the applicability of our results. In an area where there is little knowledge, these survey results can help create opioid prescribing guidelines for medicine patients for optimal prescribing of opioids for non-surgical medical patients.

## CONCLUSION

The survey results from this retrospective study indicate that creation of a prescribing guideline could help to optimize opioid prescribing among non-surgical medical patients within indications and could be valuable in reducing leftover opioid medications in the community. Overall, a strong inter-professional effort will be needed to incorporate these results into an accurate institutional guideline among this understudied patient population.

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**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11606-021-07092-x>.

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#### Declarations:

**Conflict of Interest:** The authors declare that they do not have a conflict of interest.

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