Research CPD

Opioid prescribing requirements to minimize unused medications after an emergency department visit for acute pain: a prospective cohort study

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Abstract

Background: Unused opioid prescriptions can be a driver of opioid misuse. Our objective was to determine the optimal quantity of opioids to prescribe to patients with acute pain at emergency department discharge, in order to meet their analgesic needs while limiting the amount of unused opioids.

Methods: In a prospective, multicentre cohort study, we included consecutive patients aged 18 years and older with an acute pain condition present for less than 2 weeks who were discharged from emergency department with an opioid prescription. Participants completed a pain medication diary for real-time recording of quantity, doses, and names of all analgesics consumed during a 14-day follow-up period.

Results: We included 2240 participants, who had a mean age of 51 years; 48% were female. Over 14 days, participants consumed a median of 5 (quartiles, 1–14) morphine 5 mg tablet equivalents, with significant variation across pain conditions ($p < 0.001$). Most opioid tablets prescribed (63%) were unused. To meet the opioid need of 80% of patients for 2 weeks, we found that those experiencing renal colic or abdominal pain required fewer opioid tablets (8 morphine 5 mg tablet equivalents) than patients who had fractures (24 tablets), back pain (21 tablets), neck pain (17 tablets), or other musculoskeletal pain (16 tablets).

Interpretation: Two-thirds of opioid tablets prescribed at emergency department discharge for acute pain were unused, whereas opioid requirements varied significantly based on the cause of acute pain. Smaller, cause-specific opioid prescriptions could provide adequate pain management while reducing the risk of opioid misuse. **Trial registration:** ClinicalTrials.gov, no. NCT03953534.

Opioid overdoses killed 68 630 people in the United States[1] in 2020 and 7560 in Canada[2] in 2021, and these numbers are projected to continue to rise until 2025.[3] Overprescribing is associated with opioid-related misuse or opioid overdose,[4] and household prescription availability is associated with increased odds of opioid overdose.[5] Almost 50% of people who misuse prescription opioids obtain them from a friend or relative.[6,7]

Although the emergency departments' contribution to the quantity of opioids prescribed each year is small (approximately 4%),[8] about half of patients with opioid use disorder report that they were first exposed to opioids by a legitimate prescription and almost 20% were prescribed in the emergency department.[6,9] Additionally, data from the National Ambulatory Care Reporting System show that between April 2022 and March 2023, Canada recorded more than 15.1 million unscheduled emergency department visits, compared with almost 14.0 million in 2021–2022.[10] The median time from exposure to the onset of misuse for these patients is 6 months,[9] and unused opioids are rarely disposed of or stored properly, leaving them available for future misuse.[11–13] However, about 80% of people

who misuse prescription opioids have a previous substance use disorder, and 93% have a history of using psychoactive drugs before being exposed to opioids.[6]

Several interventions have been proposed to limit the rate and quantity of prescribed opioids after an emergency department visit.[11–14] However, most interventions reduced opioid prescription rates but not the quantity prescribed to patients discharged from the emergency department.[15] As higher quantities of prescribed opioids are associated with higher quantities of consumed opioids,[16,17] it is important to adapt opioid prescription practices to patients' analgesic needs for specific acute pain conditions while minimizing the number of unused opioid tablets that can be diverted or misused.[18]

Five studies reporting opioid use for acute pain complaints after emergency department discharge showed considerable variability in the quantity of consumed opioids, depending on the acute painful condition.[19–23] These studies also reported that 33%–68% of total prescribed opioid tablets were unused.[19,20,22] However, these studies had limitations: they were single centre, had a small sample size, or used a telephone survey 14–21 days after patient discharge, which can be biased by memory recall.[22]

Our main objective was to determine the optimal quantity of opioids to prescribe to meet patients' analgesic needs and limit the quantity of unused opioids for emergency department–discharged patients treated for acute pain. Our secondary objectives were to describe the percentage of unused opioids and the daily profile of analgesic consumption.

Methods

Study design and setting

We conducted this prospective observational cohort study in 6 emergency departments of academic tertiary care level 1 trauma hospitals (Hôpital du Sacré-Coeur-de-Montréal, Hôpital Maisonneuve-Rosemont, Hôpital de l'Enfant-Jésus, The Ottawa Hospital, Victoria Hospital [London, Ont.], and Sunnybrook Health Sciences Centre) and 1 community hospital (Hôpital Jean-Talon) in Canada. The annual census across the recruiting hospitals ranged from 43 000 for the community hospital to 150 000 emergency department visits. A community patient partner was involved in the design and conduct of the study. This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[24]

Selection of participants

Consecutive eligible patients aged 18 years and older treated in the emergency department between May 2019 and January 2023 were identified by emergency department clinicians 24/7 and then recruited by research assistants. We suspended recruitment of participants from March through October 2020 because of the COVID-19 pandemic. We included patients with an acute pain condition present for less than 2 weeks, who were discharged from the emergency department with an opioid prescription. We excluded patients who did not speak English or French, who were unable to fill out a diary or were unavailable for follow-up, were already using any medications with an opioid effect (prescribed or not) before the emergency department visit, or who had cancer or chronic pain.

Procedures

Emergency clinicians identified eligible patients, who were then contacted by a research assistant. Research assistants verified exclusion criteria and subsequently obtained informed consent. If a research assistant was not available (e.g., nighttime), emergency department clinicians provided patients with written information on the study, which included a paper diary and information on accessing the electronic diary. These patients were later contacted by phone to obtain delayed written informed consent (or consent was recorded verbally after the height of the COVID-19 pandemic).

The final diagnosis category (renal colic, abdominal pain, fracture, back pain, neck pain, other musculoskeletal, or other), pain intensity at discharge, and pain medications prescribed were collected from a form completed by the treating physician. Age, sex, pain intensity at triage, opioid use during emergency department stay, and length of emergency department stay were extracted from each hospital's computerized medical system. We measured pain intensity on an 11-point numerical rating scale from 0 to 10, where 0 represented no pain and 10 the worst pain imaginable. On the first day after discharge from the emergency department, participants were asked to respond to the initial questionnaire, which included baseline characteristics. Study participants also self-identified their ethnicity from 7 categories, based on the 2019 version of the Canadian Institute for Health Information's inpatient care data dictionary manual.[25] We used the ethnicity variable solely to assess population generalizability. Patients used a 14-day electronic pain medication diary for real-time recording of quantity, time, and names of all pain medications consumed each day (including over-the-counter medications). A previously tested paper version of the diary was provided to patients without Internet access or with lower computer literacy.[19] Participants were blinded to the main outcome and were told only that the objective of the study was to identify the consumption of all medication necessary to relieve pain. To help ensure complete data collection, a research assistant also interviewed all patients over the phone 2 weeks after their emergency department visit. Patients were asked whether they had filled their initial opioid prescription, the quantity of opioids they had consumed, whether they had filled any new opioid prescription, and how much they had consumed in the last 2 weeks. We chose the 2-week follow-up period because most patients stop taking opioids for acute pain during that time frame (88% in our previous study).[19] We collected study data and managed it using Research Electronic Data Capture (REDCap), a secure, Web-based application tool hosted in the Hôpital Sacré-Coeur de Montréal.[26] We previously assessed the self-reported medication consumption diary for social desirability and recall bias in a subsample of 166 participants from this study; it was shown to be accurate, with an intraclass correlation coefficient (ICC) of 0.99 and a Bland–Altman mean difference of 0.048 pills.[27]

Outcomes

The main outcome measure was the quantity of opioid tablets consumed during a 2-week follow-up period, extracted from the electronic diary, paper diary, or phone interview (if the diary was not completed or returned), for each pain condition. We could not sum the quantity of opioid tablets directly owing to the different potency and dosage of various opioids.[28,29] Thus, we converted each opioid prescription and consumption into morphine 5 mg tablet equivalents. We considered a dosage of 3.33 mg of oxycodone, 1.25 mg of hydromorphone, 33.3 mg of codeine, and 50 mg of tramadol to be equipotent to 1 morphine 5 mg tablet.[30,31]

The 6 most frequently reported emergency department pain condition categories served as stratification variables for our main outcome: fractures, renal colic, back pain, neck pain, abdominal pain, and other musculoskeletal pain.[19,20,22,32] Other musculoskeletal pain was defined as contusion, bursitis, strain, muscle or tendon tear, sprain, dislocation, or tendinitis. For the sake of comprehensiveness, we also included a group of patients with all other uncategorized pain conditions (e.g., abscess, burn, tooth pain).

We used the quantity of consumed opioids to determine the number of morphine 5 mg tablet equivalents that would meet the opioid needs of 80% of patients for 2 weeks. The 80% threshold was used in previous studies[19,20,33] to provide a reasonable balance between sufficient supply of medication for a large majority of patients while limiting the quantity of unused opioids. Because several US states have limited opioid prescriptions to a maximum of 7 days after an emergency department visit,[34] we also determined the quantity to meet the opioid need of 80% of patients for 7 days. We additionally reported the percentage of prescribed opioid tablets that were unused after a 2-week follow-up, and the proportion of participants using opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and acetaminophen throughout the same period.

Statistical analysis

We wanted to have enough patients to estimate, with a fairly tight margin of error, the mean quantity of morphine 5 mg tablet equivalents consumed for each of the most frequent pain conditions (acute back pain, fracture, sprain or contusion, renal colic, and other). Using a standard deviation (SD) of 16, observed during our previous work,[19] to estimate a 2-sided 95% confidence interval (CI) with a small margin of error of 1.5 (about 10% of the SD), a total of 2200 participants was required (all pain conditions put together). Accounting for the 18% lost-to-follow-up rate observed in our previous study,[19] we needed to recruit 2685 participants (Power Analysis and Sample Size version 11.0; NCSS, Kaysville, Utah).

We used descriptive statistics to compare baseline characteristics between included and excluded patients, as well as baseline characteristics and quantity of consumed pain medication across sites using mean with SD (or median ± interquartile range for non-normally distributed variables) for continuous variables and proportions for categorical variables. We used the ICC to assess the concordance, based on absolute agreement, between the 14-day diary (paper or electronic version) and phone interview on the quantity of morphine 5 mg tablet equivalents consumed. The quantity of morphine 5 mg tablet equivalents to prescribe to meet the need of 80% of patients was determined with the cumulative frequency distribution for each pain condition. We used Mann–Whitney *U* tests to assess the effect of sex and age (< 65 yr v. ≥ 65 yr) on the quantity of morphine 5 mg tablet equivalents consumed. We used the Kruskal–Wallis test to compare the quantity of consumed morphine 5 mg tablet equivalents across pain conditions. We made pairwise comparisons of the quantity of consumed morphine 5 mg tablet equivalents across pain conditions using Mann–Whitney *U* tests with Bonferroni correction for multiple testing. Finally, we used 1-way analysis of variance (ANOVA) with Tukey B post-hoc comparison tests to compare the percentage of unused opioids across pain conditions. We used an α level of 0.05, and performed all statistical analysis using SPSS version 23 (IBM, Somers, NY).

Ethics approval

We obtained approval from each local institutional ethics review board.

Results

During the recruitment period, 10 577 patients aged 18 years or older presented to participating emergency departments with acute pain and were discharged with an opioid prescription. Of these, 6033 patients were screened and met eligibility criteria; 2590 agreed to participate, and 2240 provided data on the primary study outcome (Figure 1). Nonparticipating and included patients were similar on all baseline characteristics (Appendix 1, Supplemental Table 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.231640/tab-related-content). Most participants were recruited from tertiary sites in the province of Quebec (78%), 14% from a community centre in Quebec, and 7% from tertiary sites in Ontario. The type of prescribed opioid was slightly different between sites: Ontario sites prescribed hydromorphone, codeine, and a combination of opioids with acetaminophen more often than Quebec sites (Table 1). Mean pain intensity at triage was a little higher in the tertiary hospital sites in Quebec than those in Ontario, and participants from Ontario sites were treated more often with opioids during emergency department stays than those from Quebec sites.

Participants' mean age was 51 (SD ± 16) years, 48% were female, and mean pain intensity at triage was 7.1 (SD ± 2.1). Among 2240 participants, 77% (*n* = 1718) were White, 86% (*n* = 1917) preferred speaking French, and 68% (*n* = 1516) had a college or university degree (Appendix 1, Supplemental Table 2). Of the participants, the quantity of consumed opioid was extracted from the 14-day diary for 80% (*n* = 1792) of the sample and the rest from the phone interview. Among participants, 72% (*n* = 1612) completed both assessments, showing good concordance[35] (ICC 0.78, 95% CI 0.74–0.81). Furthermore, the median number of morphine 5 mg tablet equivalents consumed was the same (*n* = 5) for both phone interview and the 14-day diary. About half (53%; *n* = 950) of participants completed the electronic diary, and the opioid consumption was similar for paper and electronic diaries (median of 5 for the paper and 4 for the electronic diaries).

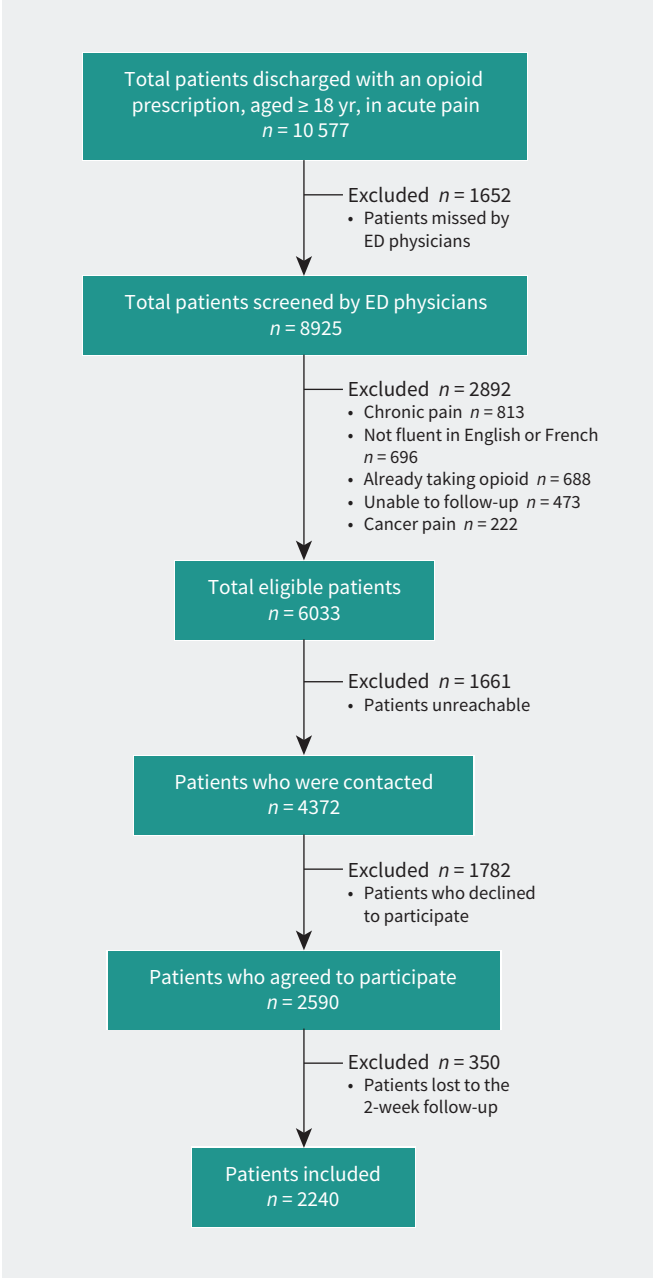

Figure 1: Flow chart of patient enrolment in the study. Note: ED = emergency department.

Table 1: Baseline characteristics across the different hospital sites

Variable	Quebec tertiary sites* n = 3	Quebec community site† n = 1	Ontario tertiary sites‡ n = 3
Mean ± SD age, yr	51.1 ± 15.2	46.2 ± 16.1	52.1 ± 16.2
Female, %	48.2	47.7	49.1
Mean ± SD pain intensity at triage, 0–10 scale	7.3 ± 2.2	6.6 ± 2.1	6.3 ± 2.8
Type of pain condition, %			
Renal colic	17.8	21.7	28.0
Fracture	24.5	23.5	14.9
Back pain	17.0	13.0	21.1
Neck pain	3.2	1.5	2.5
Other musculoskeletal	19.2	17.6	12.4
Abdominal pain	7.1	8.4	9.3
Other	11.2	14.2	11.8
Opioid prescription type, %			
Morphine	52.1	67.8	26.9
Oxycodone	13.3	4.3	0
Hydromorphone	31.8	26.9	51.9
Codeine + acetaminophen	0	0	10.6
Tramadol + acetaminophen	2.4	1.0	4.4
Oxycodone + acetaminophen	0.3	0	6.3
Treated with opioid within the ED, %	57.8	60.0	83.1
Median (Q1–Q3) ED stay, h	5.7 (3.9–8.5)	5.7 (4.0–8.5)	5.8 (3.5–8.2)

Note: ED = emergency department, Q1–Q3 = first and third quartile, SD = standard deviation.
*Quebec tertiary sites = Hôpital Sacré-Coeur de Montréal, Hôpital Maisonneuve-Rosemont, Hôpital Enfant-Jésus.
†Quebec community site = Hôpital Jean-Talon.
‡Ontario tertiary sites = The Ottawa Hospital, Victoria Hospital (London, Ont.), Sunnybrook Health Sciences Centre.

Mean pain intensity at emergency department discharge and at the 2-week follow-up were lower for participants with renal colic or abdominal pain than other pain conditions (Table 2). Almost all participants filled their opioid prescription during the 2-week follow-up period (93%; *n* = 2074). The median quantity of prescribed morphine 5 mg tablet equivalents was 16, and this quantity was similar across all pain categories.

The quantity of opioids consumed during the 14 days was low for the whole sample (median 5 morphine 5 mg tablet equivalents, quartiles 1–14) and varied across pain conditions ($p < 0.001$). Patients with renal colic or abdominal pain consumed the smallest amount of opioids over 14 days — a median of 2 (quartiles 0–6) morphine 5 mg tablet equivalents — compared with patients with fractures (9, quartiles 2–20), back pain (8, quartiles 3–18), neck pain (6, quartiles 2–16), or other musculoskeletal pain (6, quartiles 2–15) for all comparisons. In addition, patients with other pain conditions not included in previous categories consumed fewer opioids (4, quartiles 1–9) than patients with fractures or back pain ($p < 0.01$ for both comparisons). Patients with fractures (17.5%) and back pain (12.1%) filled an additional opioid prescription more often than all other pain conditions (Table 2). We observed no significant effect of age (< 65 yr v. ≥ 65 yr) or sex on the quantity of consumed opioids during the 14-day follow-up ($p = 0.4$ and $p = 0.8$, respectively; Appendix 1, Supplemental Table 3). In addition, the quantity of opioids consumed was similar across the different hospital sites (Appendix 1, Supplemental Table 4).

Table 2: Pain intensity and pain medication for each pain condition during the 2-week follow-up

Variable	Renal colic	Abdominal pain	Fracture	Back pain	Neck pain	Musculo-skeletal	Other	Total
No. of patients	428	166	531	374	65	415	261	2240
Mean ± SD pain intensity at ED discharge, 0–10 scale	2.5 ± 2.5	3.6 ± 2.6	5.5 ± 2.4	6.0 ± 2.5	6.3 ± 2.5	5.5 ± 2.5	5.4 ± 2.8	4.8 ± 2.9
Mean ± SD pain intensity at 14 d, 0–10 scale	1.0 ± 2.0	1.4 ± 2.1	3.4 ± 2.2	3.6 ± 2.5	3.6 ± 2.5	3.3 ± 2.6	2.3 ± 2.6	2.7 ± 2.6
Received acetaminophen prescription at discharge, %	46.0	33.7	57.1	50.5	52.3	48.0	39.2	48.2
Received NSAIDs prescription at discharge, %	67.5	27.7	30.7	56.4	52.3	42.4	28.5	44.4
Filled opioid prescription, %	92.5	86.9	93.7	94.2	89.2	93.2	91.6	92.6
Filled additional opioid prescription, %	8.5	4.6	17.5	12.1	4.9	9.7	5.6	10.8
Median (Q1–Q3) no. of morphine 5 mg tablets prescribed	16 (12–20)	15 (10–20)	16 (12–24)	17 (12–24)	18 (11–30)	16 (10–20)	15 (10–23)	16 (10–23)
Median (Q1–Q3) no. of morphine 5 mg tablets consumed, 7 d	2 (0–4)	2 (0–5)	7 (2–14)	7 (2–14)	6 (3–15)	5 (1–12)	3 (0–8)	4 (1–11)
Median (Q1–Q3) no. of morphine 5 mg tablets consumed, 14 d	2 (0–6)	2 (0–6)	9 (2–20)	8 (3–18)	6 (2–16)	6 (2–15)	4 (1–9)	5 (1–14)
Median (Q1–Q3) no. of morphine 5 mg tablets unused, 14 d	12 (8–18)	10 (5–14)	7 (4–16)	9 (3–16)	7 (3–15)	9 (5–15)	10 (5–17)	10 (5–16)

Note: ED = emergency department, NSAID = nonsteroidal anti-inflammatory drug, Q1–Q3 = first to third quartile, SD = standard deviation.

The quantity of morphine 5 mg tablet equivalents required to meet the need of 80% of patients for 2 weeks and for 7 days is reported in Figure 2. Over 2 weeks, patients experiencing renal colic, abdominal pain, and other uncategorized pain conditions required fewer opioids (8–11 tablets) than patients with musculoskeletal pain (16–24 tablets). Over 7 days, the quantity of opioids required was lower but showed similar variations across pain conditions. Analysis across all thresholds using cumulative distribution curves for the proportion of patients whose opioid requirements would be met showed that patients with renal colic, abdominal pain, and other uncategorized pain conditions consistently consumed lower amounts of opioids than patients with fractures, back and neck pain, and other musculoskeletal pain (Figure 3).

For the 2240 participants discharged from the emergency department, 41 665 morphine 5 mg tablet equivalents were prescribed, of which 15 457 were consumed during the 2-week follow-up period, leaving 26 207 (63%) unused morphine 5 mg tablet equivalents. The percentage of unused opioids showed significant differences across pain conditions ($p < 0.001$): compared with patients with fractures, back pain, neck pain, or other musculoskeletal pain, patients experiencing renal colic and abdominal pain conditions had higher unused opioid percentages, followed by the other pain condition category (Figure 4).

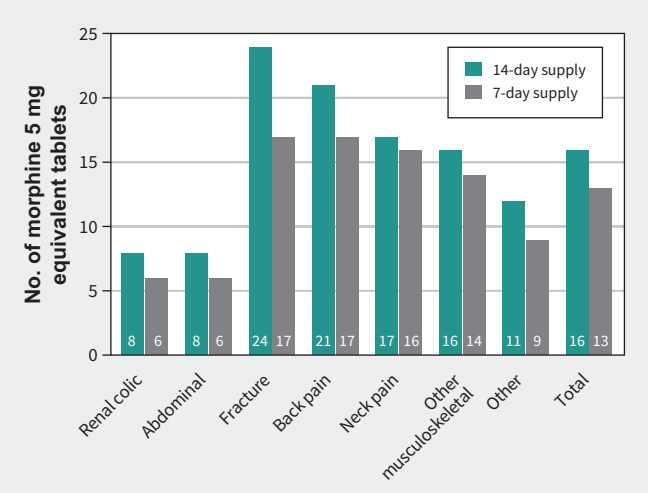

Figure 2: Number of morphine 5 mg tablet equivalents to prescribe to meet the needs of 80% of patients for 14 days and for 7 days for each pain condition category.

The percentages of patients consuming opioids, NSAIDs, and acetaminophen for each day during the 14-day follow-up are reported in Figure 5. Two-thirds (67%) of participants consumed opioids on the first day after emergency department discharge, and that number gradually decreased to 12% on day 14.

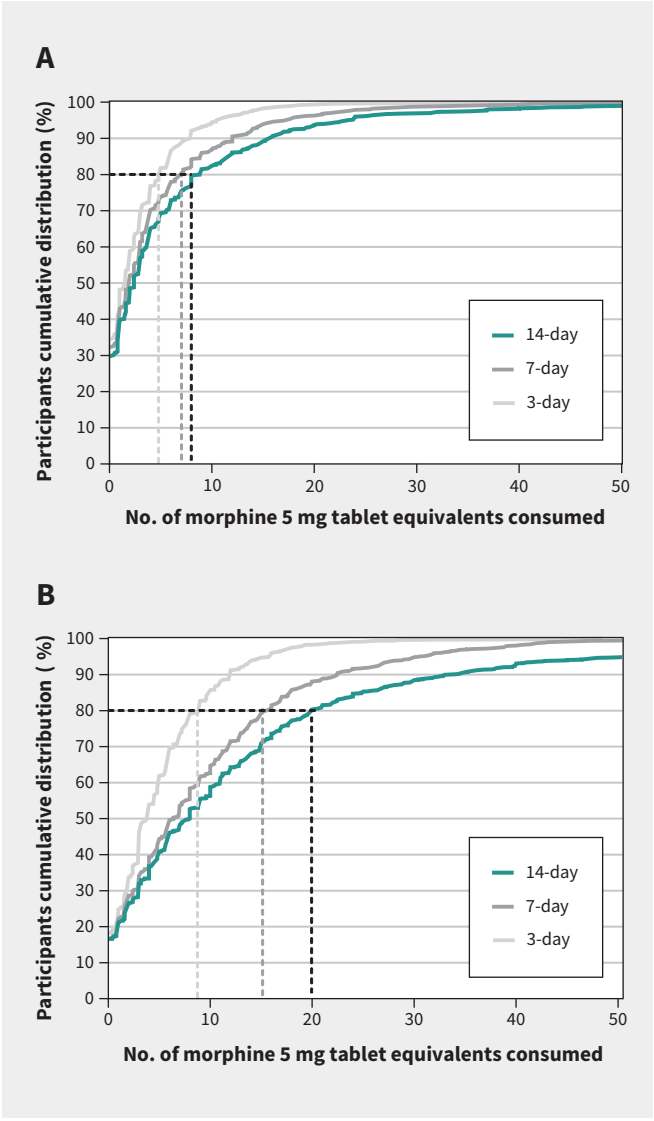

Figure 3: Cumulative distribution of quantity of 5 mg morphine tablet equivalents to prescribe to meet the need of patients with (A) renal colic, abdominal pain, and other pain conditions, and (B) fracture, back pain, neck pain, and other musculoskeletal pain.

Similarly, acetaminophen consumption was highest on day 1, at 62%, and decreased to 30% on day 14. Consumption of NSAIDs peaked on day 2 at 44% and declined to 16% on day 14.

Interpretation

This large, multicentre prospective study showed that patients discharged from the emergency department with an acute pain condition consumed a median of only 5 tablets of 5 mg morphine equivalent during the 2 subsequent weeks. Furthermore, the quantity consumed varied significantly between specific pain conditions, as did the quantity to meet the opioid need of 80% of patients for this duration, from 8 tablets for renal colic or abdominal pain to 24 tablets for fractures. Finally, most patients had stopped using opioids by the end of 2 weeks, leaving almost two-thirds of the opioids unused and potentially available for misuse.

In this study, the quantity of opioids consumed by patients discharged from the emergency department with a pain condition was similar to that reported in our previous, smaller, single-site study.[19] McCarthy and colleagues also studied opioid consumption in patients discharged from an emergency department, but they included only patients receiving a prescription of hydrocodone–acetaminophen combination at a single site. They reported a consumption of 9 tablets (median) of 5 mg morphine equivalent during a 10-day follow-up.[20] Another small study using only telephone follow-up after emergency department discharge reported the same quantity of tablets (9; median) consumed during a median 15 days of follow-up.[22] Both studies report larger consumption than the 5 morphine 5 mg tablet equivalents consumed during our 2-week follow-up. This difference could be explained by the frequent use of opioid–acetaminophen combinations (100% and 86%), which limits the patient's ability to optimize co-analgesia with acetaminophen and may increase opioid consumption; in the study by McCarthy and colleagues, only 8.5% used acetaminophen, compared with 62% in our study.

Patients experiencing renal colic or abdominal pain required fewer opioids (8 tablets) than patients with fractures (24 tablets), back pain (21 tablets), neck pain (17 tablets), or other musculoskeletal pain. McCarthy and colleagues also found that patients with renal colic used fewer opioids than those with other painful conditions.[20] This could be explained by its unique pain resolution pattern of episodic intense pain until the stone is expelled. Our results emphasize the need for clinicians to adjust their opioid prescriptions to the type of painful condition. We also showed that half of patients consume 5 or fewer tablets of morphine 5 mg tablet equivalents and that only 12% of patients still consume opioids on day 14, which is very close to the 13.8% found by McCarthy and colleagues on day 10.

Clinicians choosing to prescribe opioids could adapt the quantity of prescribed opioids to the specific painful condition based on the quantity of morphine 5 mg tablet equivalents required to meet the needs of 80% of patients described in our results. Phamacists are allowed to provide a fraction of the total number of opioid prescribed (partitioned dispensation). Therefore, clinicians could add in the prescription to dispense initially only a fraction of the total quantity of prescribed opioids (established from our median quantity of consumed opioids), with the patient returning to the pharmacy if more tablets are needed. The expected duration of the prescription could also be added. Pharmacists would not provide remaining portions beyond the expected duration of the prescription (i.e., an expiration date for the prescription after 3, 7, or 14 d). Adding an expiration date on an opioid prescription has been used in postsurgery settings and proved effective for limiting access to unused opioids.[36,37] Additionally, legislation and regulations in many European countries limit opioid prescription validity from 5 days to 13 weeks.[38] For example, for a patient with renal colic, a clinician could prescribe 8 tablets of 5 mg morphine and ask the pharmacist to supply only 4 tablets at a time, with a prescription's expiration date in 2 weeks. For a fracture, a clinician could prescribe 24 tablets to be dispensed 12 tablets at a time, with an expiration date in

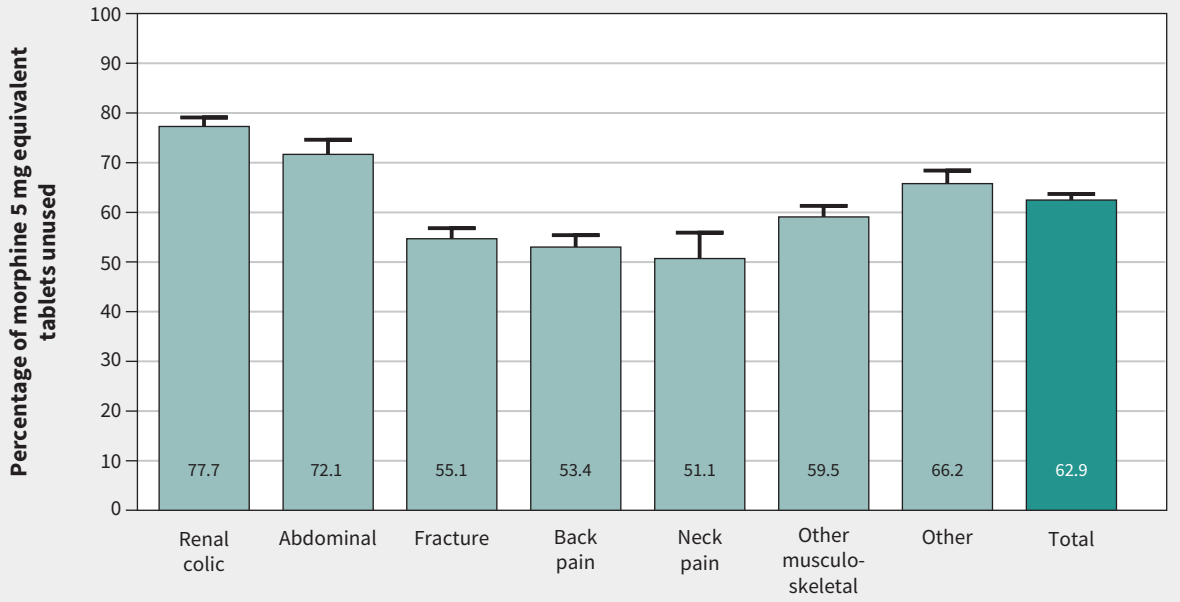

Figure 4: Percentage of morphine 5 mg tablet equivalents that remained unused after the 2-week follow-up for each pain condition category. Note: Mean ± standard error of the mean is reported.

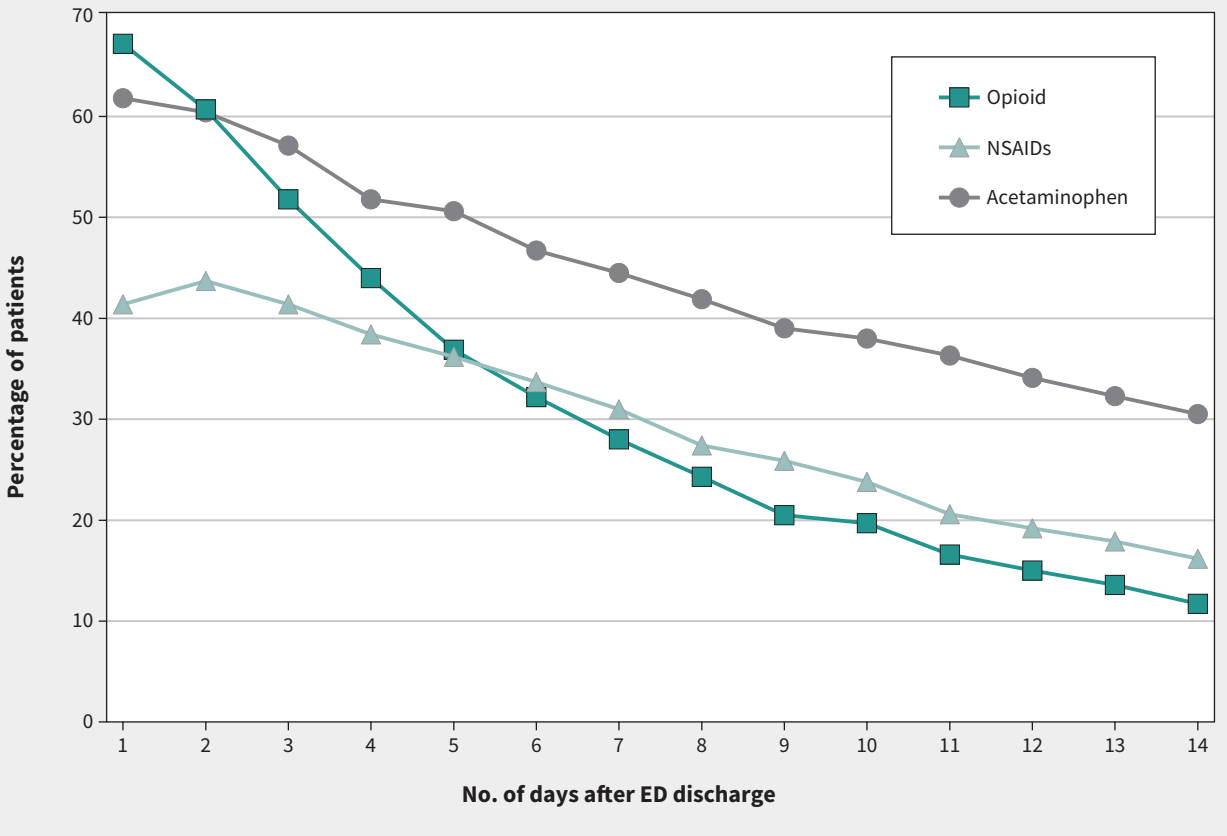

Figure 5: Percentage of patients consuming opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and acetaminophen for each day of the 14-day follow-up after emergency department (ED) discharge. Data extracted from diary only (1798 patients).

Table 3: Full and partitioned* opioid prescriptions sufficient to meet the analgesic need for 80% of the participants for 14 d, for morphine 5 mg tablets and conversion to equivalent doses of other opioid medications

	Renal colic, abdominal pain, other unspecified pain categories		Fracture, back and neck pain, other musculoskeletal pain	
Type of opioid (dose)	Full prescription, no. of tablets	Partitioned prescription, no. of tablets	Full prescription, no. of tablets	Partitioned prescription, no. of tablets
Morphine (5 mg)	8	4	24	12
Oxycodone (5 mg)	5	3	16	8
Hydromorphone (1 mg)	10	5	30	15
Codeine (30 mg)	9	5	27	13
Tramadol (50 mg)	8	4	24	12

*"Partitioned" indicates number of tablets dispensed by pharmacist initially, with the patient returning to the pharmacy if more tablets are needed.

2 weeks. Equivalent prescriptions for other types of opioids are provided in Table 3. A similar method could be used if the clinician needs to limit the prescription to 3 or 7 days (Figure 3). Future research could determine the balance between limiting unused opioids and patient inconvenience; partitioning in smaller portions could be a burden for patients and adds the cost of additional pharmacist services.

Limitations

Many patients who were prescribed opioids were not enrolled, which may have affected the representativeness of our sample. However, baseline variables were similar between included patients and those who were missed, could not be reached, declined to participate, or were lost to follow-up, but this does not eliminate the possibility of substantial selection bias, which limits generalizability. Most participants were from 1 province, and this could affect the main outcomes, given differences in prescribing practices. The number of participants with neck pain was low; therefore, caution must be observed for this specific condition. Moreover, the reasons that participants stopped consuming opioids were not recorded. We did not record whether participants had drug insurance, which could affect opioid consumption. However, participants from Quebec sites were all covered by medication insurance. Some patients may have restricted their opioid use owing to adverse effects, fear of addiction, or fear of running out of tablets, among other reasons. Finally, the conversion method used in this study to estimate the equivalent of a 5 mg morphine tablet is only an approximation, and the analgesic effect may vary with specific opioids in real-world conditions.

Conclusion

The quantity of opioids consumed during 2 weeks after emergency department discharge by patients presenting with acute pain was low (5 morphine 5 mg tablet equivalents) and varied significantly among specific pain conditions, as did the quantity to meet the opioid need of 80% of patients during the same period, from 8 tablets for renal colic or abdominal pain to 24 tablets for fractures. Furthermore, two-thirds of prescribed opioid tablets were unused. Our findings may provide guidance to enable clinicians to prescribe lower quantities of opioids and provide them in even smaller portions tailored to the specific cause of acute pain, thereby allowing adequate pain relief while reducing the risk of opioid misuse.

References

1. Drug overdose death rates. Bethesda (MD): National Institute on Drug Abuse; 2023. Available: https://nida.nih.gov/research-topics/trends-statistics/overdose-death-rates (accessed 2023 Nov. 23).
2. Opioid- and stimulant-related harms in Canada. Ottawa: Public Health Agency of Canada; modified 2024 Mar. 27. Available: https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants/ (accessed 2023 Nov. 23)
3. Chen Q, Larochelle MR, Weaver DT, et al. Prevention of prescription opioid misuse and projected overdose deaths in the United States. *JAMA Netw Open* 2019;2:e187621. doi: 10.1001/jamanetworkopen.2018.7621.
4. Fink BC, Uyttebrouck O, Larson RS. An effective intervention: limiting opioid prescribing as a means of reducing opioid analgesic misuse, and overdose deaths. *J Law Med Ethics* 2020;48:249-58.
5. Hendricks MA, El Ibrahimi S, Ritter GA, et al. Association of household opioid availability with opioid overdose. *JAMA Netw Open* 2023;6:e233385. doi: 10.1001/jamanetworkopen.2023.3385.
6. Cicero TJ, Ellis MS, Kasper ZA. Psychoactive substance use prior to the development of iatrogenic opioid abuse: a descriptive analysis of treatment-seeking opioid abusers. *Addict Behav* 2017;65:242-4.
7. Lipari RN, Hughes A. How people obtain the prescription pain relievers they misuse. In: *The CBHSQ Report*. Rockville (MD): Substance Abuse and Mental Health Services Administration (US); 2013:1-7.
8. Axeen S, Seabury SA, Menchine M. Emergency department contribution to the prescription opioid epidemic. *Ann Emerg Med* 2018;71:659-67.e3.
9. Butler MM, Ancona RM, Beauchamp GA, et al. Emergency department prescription opioids as an initial exposure preceding addiction. *Ann Emerg Med* 2016;68:202-8.
10. NACRS emergency department visits and lengths of stay. Ottawa: Canadian Institute for Health Information; 2024. Available: https://www.cihi.ca/en/nacrs-emergency-department-visits-and-lengths-of-stay (accessed 2024 Mar. 11).
11. del Portal DA, Healy ME, Satz WA, et al. Impact of an opioid prescribing guideline in the acute care setting. *J Emerg Med* 2016;50:21-7.
12. Doyon S. A performance improvement prescribing guideline reduces opioid prescriptions for emergency department dental pain patients. *Ann Emerg Med* 2014;63:371.
13. Delgado MK, Shofer FS, Patel MS, et al. Association between electronic medical record implementation of default opioid prescription quantities and prescribing behavior in two emergency departments. *J Gen Intern Med* 2018;33:409-11.
14. Santistevan JR, Sharp BR, Hamedani AG, et al. By default: the effect of prepopulated prescription quantities on opioid prescribing in the emergency department. *West J Emerg Med* 2018;19:392-7.

15. Daoust R, Paquet J, Marquis M, et al. Evaluation of interventions to reduce opioid prescribing for patients discharged from the emergency department: a systematic review and meta-analysis. *JAMA Netw Open* 2022;5:e2143425. doi: 10.1001/jamanetworkopen.2021.43425.
16. Farley KX, Anastasio AT, Kumar A, et al. Association between quantity of opioids prescribed after surgery or preoperative opioid use education with opioid consumption. *JAMA* 2019;321:2465-7.
17. Howard R, Fry B, Gunaseelan V, et al. Association of opioid prescribing with opioid consumption after surgery in Michigan. *JAMA Surg* 2019;154:e184234. doi:10.1001/jamasurg.2018.4234.
18. Daoust R. Limiting opioid prescribing. *JAMA* 2019;322:170-1.
19. Daoust R, Paquet J, Cournoyer A, et al. Quantity of opioids consumed following an emergency department visit for acute pain: a Canadian prospective cohort study. *BMJ Open* 2018;8:e022649. doi: 10.1136/bmjopen-2018-022649.
20. McCarthy DM, Kim HS, Hur SI, et al. Patient-reported opioid pill consumption after an ED visit: How many pills are people using? *Pain Med* 2021;22:292-302.
21. Meltzer AC, Wolfson AB, Mufarrij P, et al. Analgesic and opioid use for patients discharged from the emergency department with ureteral stones. *J Endourol* 2021;35:1067-71.
22. Shi R, Quinones A, Bair J, et al. Patient utilization of prescription opioids after discharge from the emergency department. *Am J Emerg Med* 2020;38:1568-71.
23. Wentz AE, Wang RC, Marshall BDL, et al. Opioid analgesic use after an acute pain visit: evidence from a urolithiasis patient cohort. *West J Emerg Med* 2022;23:864-71.
24. von Elm E, Altman DG, Egger M, et al.; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Int J Surg* 2014;12:1495-9.
25. *Canadian Patient Experiences Survey: inpatient care data dictionary manual*. Ottawa: Canadian Institute for Health Information; 2019:1-74.
26. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap): a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377-81.
27. Daoust R, Paquet J, Williamson D, et al. Accuracy of a self-report prescription opioid use diary for patients discharge from the emergency department with acute pain: a multicentre prospective cohort study. *BMJ Open* 2022;12:e062984. doi: 10.1136/bmjopen-2022-062984.
28. Daoust R, Paquet J, Lavigne G, et al. Impact of age, sex and route of administration on adverse events after opioid treatment in the emergency department: a retrospective study. *Pain Res Manag* 2015;20:23-8.
29. O'Neil JT, Wang ML, Kim N, et al. Prospective evaluation of opioid consumption after distal radius fracture repair surgery. *Am J Orthop* 2017;46:E35-40.
30. Berdine HJ, Nesbit SA. Equianalgesic dosing of opioids. *J Pain Palliat Care Pharmacother* 2006;20:79-84.
31. Opioid conversion calculator. Salem (OR): Oregon Health Authority. Available: https://www.oregonpainguidance.org/opioidmedcalculator/ (accessed 2023 Sept. 15).
32. Hoppe JA, Nelson LS, Perrone J, et al.; Prescribing Opioids Safely in the Emergency Department (POSED) Study Investigators. Opioid prescribing in a cross section of US emergency departments. *Ann Emerg Med* 2015;66:253-9.e1.
33. Hill MV, McMahon ML, Stucke RS, et al. Wide variation and excessive dosage of opioid prescriptions for common general surgical procedures. *Ann Surg* 2017;265:709-14.
34. Davis CS, Lieberman AJ. Laws limiting prescribing and dispensing of opioids in the United States, 1989–2019. *Addiction* 2021;116:1817-27.
35. Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychol Assess* 1994;6:284-90.
36. Hartford LB, Van Koughnett JAM, Murphy PB, et al. The Standardization of Outpatient Procedure (STOP) narcotics: a prospective health systems intervention to reduce opioid use in ambulatory breast surgery. *Ann Surg Oncol* 2019;26:3295-304.
37. Feinberg AE, Acuna SA, Smith D, et al. Optimizing opioid prescriptions after laparoscopic appendectomy and cholecystectomy. *Can J Surg* 2021;64:E69-75.
38. Vranken MJM, Lisman JA, Mantel-Teeuwisse AK, et al. Barriers to access to opioid medicines: a review of national legislation and regulations of 11 central and eastern European countries. *Lancet Oncol* 2016;17:e13-22.

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