

# Opioid use among same-day surgery patients: Prevalence, management and outcomes

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**OBJECTIVES:** To determine whether the prevalence of opioid use among patients requiring elective same-day admission (SDA) surgery is greater than the 2.5% prevalence found in the general population. Secondary objectives were to assess compliance with expert recommendations on acute pain management in opioid-tolerant patients and to examine clinical outcomes.

**METHODS:** A retrospective review of 812 systematically sampled adult SDA surgical cases between April 1, 2008 and March 31, 2009 was conducted.

**RESULTS:** Among 798 eligible patients, 148 (18.5% [95% CI 15.9% to 21.2%]) were prescribed opioids, with 4.4% prescribed long-acting opioids (95% CI 3.0% to 5.8%). Use of opioids was most prevalent among orthopedic and neurosurgery patients. Among the 35 patients on long-acting opioids who had a high likelihood of being tolerant, anesthesiologists correctly identified 33, but only 13 (37%) took their usual opioid preoperatively while 22 (63%) had opioids continued postoperatively. Acetaminophen, nonsteroidal anti-inflammatory drugs and pregabalin were ordered preoperatively in 18 (51%), 15 (43%) and 18 (51%) cases, respectively, while ketamine was used in 15 (43%) patients intraoperatively. Acetaminophen, nonsteroidal anti-inflammatory drugs and pregabalin were ordered postoperatively in 31 (89%), 15 (43%) and 17 (49%) of the cases, respectively. No differences in length of stay, readmissions and emergency room visits were found between opioid-tolerant and opioid-naïve patients.

**CONCLUSION:** Opioid use is more common in SDA surgical patients than in the general population and is most prevalent within orthopedic and neurosurgery patients. Uptake of expert opinion on the management of acute pain in the opioid tolerant patient population is lacking.

**Key Words:** Complications; Opioid tolerance; Opioid use; Pain management, Peri-operative

In the past two decades, the number of patients treated with opioids has dramatically risen (1,2) and it is increasingly common to encounter an opioid-tolerant patient in the operating room setting (3-5). A survey of Canadian adults by Moulin et al (6) found a 29% prevalence of chronic pain and a 2.5% prevalence of opioid use, including codeine, and a 0.8% prevalence of strong opioid use, such as morphine, in the general population. Although the perioperative prevalence of opioid use is likely greater than the general population (7) given that many patients will be undergoing surgery for painful conditions, it has not been reported. This is particularly important given the implications of opioid tolerance on acute pain management.

## L'usage d'opiacés chez les patients en chirurgie d'un jour : la prévalence, la prise en charge et les résultats cliniques

**OBJECTIFS :** Déterminer si la prévalence d'utilisation d'opiacés chez les patients en chirurgie d'un jour (CUJ) non urgente est supérieure à celle de 2,5 % observée dans la population générale. Les objectifs secondaires consistaient à évaluer le respect des recommandations d'experts sur la prise en charge de la douleur aiguë chez les patients ayant une tolérance aux opiacés et à examiner les résultats cliniques.

**MÉTHODOLOGIE :** Les chercheurs ont réalisé une analyse rétrospective de 812 cas de CUJ échantillonnés systématiquement chez des adultes entre le 1<sup>er</sup> avril 2008 et le 31 mars 2009.

**RÉSULTATS :** Parmi les 798 patients admissibles, 148 (18,5 % [95 % IC 15,9 % à 21,2 %]) avaient des ordonnances d'opiacés, dont 4,4 % des opiacés à longue durée d'action (95 % IC 3,0 % à 5,8 %). La plus grande prévalence d'opiacés s'observait chez des patients en orthopédie et en neurochirurgie. Les anesthésistes ont bien dépisté 33 des 35 patients susceptibles de présenter une tolérance aux opiacés à longue durée d'action qu'ils prenaient, mais seulement 13 (37 %) ont pris leur opiacé habituel avant l'opération, tandis que l'ordonnance a été renouvelée chez 22 patients (63 %) après l'opération. Dix-huit (51 %), 15 (43 %) et 18 patients (51 %), respectivement, se sont fait prescrire de l'acétaminophène, des anti-inflammatoires non stéroïdiens (AINS) et de la prégabaline avant l'opération, 15 (43 %) ont reçu de la kétamine pendant l'opération et 31 (89 %), 15 (43 %) et 17 patients (49 %), respectivement, se sont fait prescrire de l'acétaminophène, des AINS et de la prégabaline après l'opération. Les chercheurs n'ont constaté aucune différence entre les patients ayant une tolérance aux opiacés et les patients naïfs aux opiacés sur le plan du séjour hospitalier, de la réadmission et des visites à l'urgence.

**CONCLUSION :** L'utilisation d'opiacés est plus courante chez les patients en CUJ que dans la population générale ainsi que chez les patients en orthopédie et en neurochirurgie. L'avis des experts sur la prise en charge de la douleur aiguë chez les patients ayant une tolérance aux opiacés n'est pas respecté.

The United States Food and Drug Administration has defined opioid tolerance as a minimum of 60 mg of oral morphine per day or an equianalgesic dose of another opioid for one week (8). However, this definition does not take into account that opioid tolerance is a complex process with several mediating factors (eg, genetic predisposition, receptor subtypes, cross-tolerance, receptor affinity, alterations in secondary mediators and receptor binding [9]). What is clear, however, is that the growing trend in opioid use and concomitant increase in opioid tolerance is an important consideration for the anesthesiologist and the perioperative team.

Acute pain management in patients already taking opioids is considered to be a complex undertaking with increased risk of inadequate

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postoperative pain control (10-12). Poor postoperative pain management is associated with patient dissatisfaction, medical complications and increased health care costs (13,14). Expert opinions from the majority of publications in the area of acute pain management in the setting of opioid tolerance (4,5,15). Consensus recommendations for managing acute pain in opioid-tolerant patients extend from the preoperative to the postoperative period with transition to the outpatient setting and include, but are not limited to: identification of patients on opioids, adequate preoperative assessment and planning of perioperative analgesia, continuation of usual opioid analgesics preoperatively, addition of adjuvant analgesics, expectation of higher postoperative opioid requirements, use of regional anesthesia and intensive monitoring by the acute pain team (4,5,15). However, there are only a limited number of controlled studies available to inform an evidence-based perioperative strategy for opioid-tolerant patients (16). Similarly, anesthesiologists' compliance with expert recommendations and the clinical outcomes of opioid-tolerant patients following surgery have not been evaluated. It has been suggested that the heterogeneity in this group is a barrier to designing sound clinical studies to evaluate different management strategies (17). The prevalence and demographic characteristics of opioid use and opioid-tolerance among patients presenting for surgery needs further study before testing interventions.

The primary objective of the present study was to determine the prevalence of opioid use among patients attending The Ottawa Hospital (TOH; Ottawa, Ontario) operating room for elective same-day admission (SDA) surgery. We expected that there would be greater opioid use in SDA patients compared with the general population. The secondary objectives were to examine the perioperative management of patients taking long-acting opioids and assess compliance with expert recommendations; and to examine clinical outcomes, including in-hospital complications, (LOS), emergency room (ER) visits post-discharge and readmissions for pain crises within 30 days of surgery.

## METHODS

The research was conducted at TOH, a large academic tertiary care centre (1149 beds) affiliated with the University of Ottawa. Following research ethics board approval, a data analyst identified all elective SDA surgical patients at TOH during the 12-month period from April 1, 2008 to March 31, 2009. A complete list representing all 6525 patients having SDA surgery at TOH in the study period was obtained and arranged chronologically; using systematic sampling, every eighth case was selected for review to achieve a target sample size of 800 (see sample size analysis below).

The patients included in the present study were  $\geq 18$  years of age. All surgical SDA procedures performed were eligible for sampling. SDA surgeries at TOH include orthopedics, general surgery, urology, gynecology, neurosurgery, vascular, thoracic, otolaryngology, plastics, ophthalmology and oral surgery. Patients undergoing emergency surgery or day-care surgery were not included.

Patient demographics including age, sex, surgical type and procedure were extracted from the operating room database for 812 patients. Any chart missing necessary documentation for evaluation was excluded. There were 14 missing or incomplete charts, leaving 798 complete charts available for analysis. The selection process of eligible records is summarized in Figure 1.

Patients taking prescription opioids were identified and categorized through a manual review of the Medication Reconciliation Form (MRF) completed during the preoperative assessment. The MRF lists drug, dose and frequency of administration but does not quantify daily consumption of immediate-release opioids taken as needed. At the time of the present study, there was no standard definition of opioid tolerance. Given these limitations, patients taking opioids were divided into two groups based on whether they consumed short-acting opioids only or long-acting opioids at regular intervals with or without short-acting opioids. Morphine equivalence was calculated (18) for patients taking long-acting opioids daily at regular intervals. Morphine equivalence for short-acting opioids could not be calculated because the quantity of short-acting opioids was

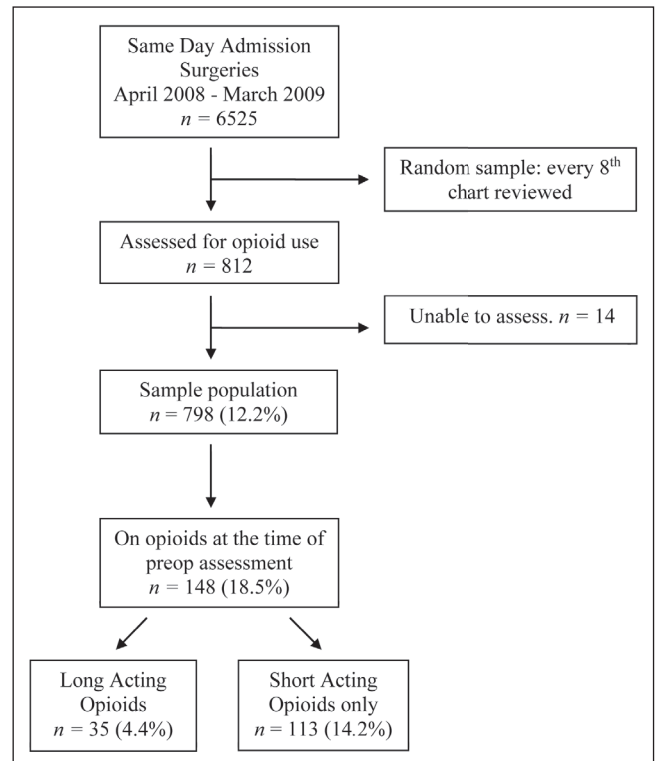


Figure 1) Identification of the study population

not recorded in the chart. Long-acting opioid users were considered to have had sufficient regular exposure to opioids to have developed dependence and tolerance requiring special management (19,20).

Detailed chart reviews were completed on all patients whose opioid medications were listed on the MRF. Investigators (RS and JW) manually extracted data from patient medical records to assess for compliance with expert recommendations on the perioperative management of the opioid-tolerant patient. The preoperative assessment records were examined to determine whether the patient's opioid use was identified as a consideration in their perioperative management. Compliance with expert recommendations was assessed by using a checklist (see Table 1 for list of items). This included a review of preoperative orders to identify which analgesics were ordered preoperatively (eg, continuation of usual opioid medications); the anesthetic record from the day of surgery to identify the type of anesthetic used, including the use of regional anesthesia and intraoperative infusions of lidocaine and ketamine; and postoperative analgesic orders to examine whether they included, for example, continuation of usual opioid medications and the use of coanalgesic agents.

Perioperative complications, including: unexpected intensive care admission; unexpected overnight stay in the recovery room; calls for rapid assessment of unstable patients by a pre-code blue team; cardiovascular events including acute coronary syndromes or rapid atrial fibrillation; chest infections requiring antibiotics; strokes; surgical site infections; and thromboembolic events were recorded from the hospital progress notes. For the two surgical groups where preoperative opioid use was most prevalent, LOS, readmissions and ER visits for pain-related complaints were also collected from electronic health records.

## Sample size analysis

There were 6525 patients who underwent elective SDA surgery in the 2008/2009 fiscal year; the target sample size of 800 was determined based on a two-sided confidence interval around an anticipated prevalence of opioid use of 8%. This sample size would yield a margin of error no greater than 1.9% and would amply allow the lower bound of the confidence

**TABLE 1**  
**Perioperative management of patients on long-acting opioids (n=35) preoperatively and compliance with expert recommendations on the perioperative management of opioid-tolerant patients**

Preoperative	
Identified as opioid tolerant	33/35 (94)
Baseline opioids taken morning of surgery	13/35 (37)
Order multimodal analgesia	
Acetaminophen	18/35 (51)
Nonsteroidal anti-inflammatory drugs	15/35 (43)
Pregabalin	18/35 (51)
Intraoperative	
Provide neuraxial or regional blockade when clinically indicated	14/20 (70)
Use nonopioids as analgesic adjuncts	
Lidocaine infusion	8/35 (23)
Intravenous ketamine	15/35 (43)
Postoperative	
Continue baseline opioids	22/35 (63)
Use multimodal analgesic techniques.	
Acetaminophen	31/35 (89)
Nonsteroidal anti-inflammatory drugs	15/35 (43)
Pregabalin	17/35 (49)
Patient-controlled analgesia as primary therapy or in addition to neuraxial or regional techniques.	20/35 (57)
Continue epidural or regional infusion	10/10 (100)

Data presented as number of cases in which there was adherence with guidelines and percent of total cases (n/n [%]). This list of expert recommendations table was adapted from the guidelines for perioperative pain management in opioid-tolerant patients outlined in Table 7 of reference 19

interval to exclude a prevalence of 2.5%. Although estimates in the literature to assist in predicting the prevalence of opioid use and tolerance in the surgical population could not be found, it was expected that this sample size would allow sufficient cases in which to begin to explore management practices and clinical outcomes at TOH.

### Statistical analysis

Patients were classified into one of three groups based on their opioid use: none, short-acting only, and long-acting with or without short-acting. Baseline clinical and demographic characteristics were described among the three groups using means and standard deviations for continuous variables, and frequencies and proportions for categorical variables. The prevalence of opioid use was determined using proportions with 95% confidence intervals. ANOVA was used to make comparisons among the three groups for continuous variables, and  $\chi^2$  tests for categorical variables. When examining differences among surgical speciality, types of surgeries with low frequencies (vascular, urology, thoracic, otolaryngology and other) were combined to allow comparisons among groups. In the present exploratory study, the authors did not control for any confounding variables.

LOS was described as median and interquartile range, and compared among the three groups using Kruskal-Wallis test. Prevalence of readmissions and ER visits within 30 days were described using frequencies and proportions, and compared among groups using  $\chi^2$  tests or Fisher's exact test where appropriate. If the overall test for differences among the three groups was significant at the 5% level, pairwise comparisons were conducted among groups, with adjustment for multiplicity using the Bonferroni correction.

## RESULTS

Table 2 presents the demographic and clinical characteristics of the study sample at the time of surgery. The prevalence of opioid use at the time of preoperative assessment was 148 (18.5% [95% CI 15.9% to

**TABLE 2**  
**Baseline demographics and distribution of surgical cases according to group**

	Opioid users				P
	Non-opioid users (n=650)	Short-acting (n=113)	Long-acting (n=35)	Total (n=148)	
Age, years, mean $\pm$ SD	61 $\pm$ 15.6	58 $\pm$ 14.6	58 $\pm$ 12.3	58 $\pm$ 14.1	0.150
Male sex	322 (50)	49 (43)	19 (54)	68 (46)	0.387
Surgical procedure					<0.0001*
Orthopedics	175 (26.9)	58 (51.3)	18 (51.4)	76 (51.4)	
Neurosurgery	41 (6.3)	11 (9.7)	10 (28.6)	21 (14.2)	
General	114 (17.5)	13 (11.5)	2 (5.7)	15 (10.1)	
Gynecological	84 (12.9)	10 (8.9)	0 (0)	10 (6.8)	
Vascular	48 (7.4)	6 (5.3)	3 (8.6)	9 (6.1)	
Urology	95 (14.6)	7 (6.2)	1 (2.9)	8 (6.5)	
Thoracics	36 (5.5)	5 (4.4)	0 (0)	5 (3.4)	
Ear, nose, throat	36 (5.5)	1 (0.9)	1 (2.9)	2 (1.4)	
Other†	21 (3.2)	2 (1.8)	0 (0)	2 (1.4)	

Data presented are taken from the 798 eligible patients and are expressed as count (percent of total for each group) unless otherwise indicated. \* $\chi^2$  test after combining vascular, urology, thoracic, otolaryngology and other surgical specialties; †Includes oral surgery, ophthalmology and plastic surgery

21.2%]). In 113 (14.2%) cases, patients were taking only short-acting medication, while in 35 (4.4% [95% CI 3.0% to 5.8%]) cases, patients were taking long-acting opioids, including transdermal fentanyl or sustained-release preparations of oxycodone, morphine and hydromorphone. No patients were taking methadone. The median daily dose in morphine equivalents in the long-acting group was 160 mg but ranged from 15 mg to 1260 mg. There were no statistically significant differences in age or sex among the three groups (non-opioid users, short-acting, and long-acting opioid users). There were significant differences in the distributions of surgical procedures across the three groups ( $P<0.0001$ ). Among all patients taking opioids preoperatively, the most frequently performed surgeries were joint replacements. In comparison, patients on long-acting opioids most often had surgical procedures in the lumbar and cervical spine. Table 3 presents details of the specific procedure type for neurosurgical and orthopedic surgeries.

Table 1 describes the perioperative management of patients on long-acting opioids. In 33 of the 35 cases, the responsible anesthesiologist identified opioid use as a factor to take into account for perioperative management. Despite this, only 15 (37%) patients received their baseline long-acting opioid on the morning of surgery as indicated in the preoperative notes and orders. Preoperatively, acetaminophen, nonsteroidal anti-inflammatory drugs and anticonvulsants, such as pregabalin, were ordered for 18 (51%), 15 (43%) and 18 (51%) patients, respectively. Twenty (57%) patients were eligible for regional anesthesia (ie, major joint surgery) but only 14 (70%) had it administered. Thirty-eight percent of the patients who did not receive regional anesthesia were administered a lidocaine infusion intraoperatively. Intravenous ketamine was administered to 15 (43%) opioid-tolerant patients. A review of postoperative orders revealed that the long-acting opioids were ordered postoperatively in 22 (63%) of the cases for postoperative day 0. Acetaminophen was ordered postoperatively in 89% of cases. Nonsteroidal anti-inflammatory drugs and pregabalin were ordered less commonly than acetaminophen, in 15 (43%) and 17 (49%) cases, respectively. Intravenous patient-controlled analgesia was ordered as either a primary therapy or as supplementation to a neuraxial or regional technique in 20 (57%) patients.

Eighty percent of patients on long-acting opioids (28 of 35) were from the orthopedic and neurosurgery services; the focus was on these two groups to explore clinical outcomes given they had the highest proportion of long-acting opioid use. Table 4 summarizes the clinical

**TABLE 3**  
Distribution of anatomical surgery locations across non-opioid and opioid users in orthopedic and neurosurgery specialties

	Non-opioid users	Opioid users		
		Short-acting	Long-acting	Total
<b>Orthopedic</b>	n=175	n=58	n=18	n=76
Hip	44 (25.1)	15 (25.9)	6 (33.3)	21 (27.6)
Knee	79 (45.1)	30 (51.7)	4 (22.2)	34 (44.7)
Shoulder	10 (5.7)	2 (3.5)	4 (22.2)	6 (7.9)
Neck	0 (0)	0 (0)	0 (0)	0 (0)
Lower back	10 (5.7)	4 (6.9)	1 (5.6)	5 (6.6)
Other	32 (18.3)	7 (12.1)	3 (16.7)	10 (13.2)
<b>Neurosurgery</b>	n=41	n=11	n=10	n=21
Neck	6 (14.6)	5 (45.5)	4 (40.0)	9 (42.9)
Lower back	8 (19.5)	4 (36.4)	5 (50.0)	9 (42.9)
Other	27 (65.9)	2 (18.2)	1 (10)	3 (14.3)

Data presented as n (%)

outcomes according to group for 313 patients having orthopedic or neurosurgery. Although the study was not powered to attempt to find differences among groups, exploratory analyses were conducted. Overall, the median LOS among opioid users was three days (interquartile range three to five days). No statistically significant differences were found in the median LOS among patients who were not taking opioids, those who were on short-acting and those who were on long-acting opioids ( $P=0.24$ ). Rates of readmission within 30 days of discharge were low among opioid users and not statistically significantly different between groups, although a trend was observed indicating higher readmissions rates among non-opioid users (9.8% among non-users versus 2.1% among opioid users;  $P=0.0512$  for the overall comparison among three groups). The rate of ER visits within 30 days of hospital discharge among opioid users was not significantly different between groups ( $P=0.63$ ).

In-hospital complications postoperatively were examined in the long-acting opioid group; there was one unexpected intensive care admission, two calls for rapid assessment of an unstable patient by a pre-code blue team, one episode of atrial fibrillation, one chest infection requiring antibiotics and one surgical site infection.

## DISCUSSION

The present study addresses an important question regarding the prevalence of opioid use in the surgical population and adherence to expert recommendations in the setting of long-acting opioid use suggestive of opioid tolerance.

At our institution, 18.5% of elective SDA adult surgical patients were using an opioid at the time of surgery, which is seven times that reported in the general Canadian population (2.5% as extracted from Moulin et al [6]) and much higher than our anticipated prevalence of 8%. In 4.4% of cases at TOH, patients were on long-acting opioids; more than five times the prevalence of strong opioid use reported in the general population. These findings support our hypothesis that prescription opioid use is more prevalent in patients scheduled for surgery than in the general population. Use of long-acting opioids was more common in the orthopedic and neurosurgical specialties relative to other surgical services, which is not surprising given the prevalence of painful conditions in these groups. These services are, therefore, excellent choices for evaluating interventions aimed at improving acute pain management in the setting of pre-existing opioid use and opioid tolerance.

Although use of opioids was recognized in the preadmission unit by the anesthesiologist, the usual dose of long-acting opioid was not taken preoperatively in most cases. Although the reasons for omission of the baseline opioid dose is likely multifactorial (eg, preoperative fasting status), this information is concerning because the absence of the usual morning dose of opioids will put patients in

**TABLE 4**  
Length of stay (LOS), and readmissions and emergency room (ER) visits within 30 days of discharge in the patient group undergoing orthopedic surgery or neurosurgery

	Non-opioid users	Opioid users			P
		Short-acting	Long-acting	Total	
	(n=216)	(n=69)	(n=28)	(n=97)	
LOS, days	4.0 (3.0–6.0)	4.0 (3.0–5.0)	3.0 (2.0–4.0)	3.0 (3.0–5.0)	0.2398
Readmissions	21 (9.8)	1 (1.5)	1 (3.6)	2 (2.1)	0.0512
ER visits	7 (3.3)	4 (5.8)	1 (3.6)	5 (5.2)	0.6335

Data presented as n (%) or median (quartile range)

an opioid debt situation, which may lead to larger doses of opioid analgesics postoperatively being required to offset this debt and manage acute pain. Adherence with expert guidelines regarding the use of multimodal analgesia perioperatively was less than anticipated but due to the retrospective nature of the study, the impact on pain scores and patient satisfaction with care is unknown. We also cannot rule out that this decision was motivated by legitimate medical reasons (eg, allergy, previous intolerance). However, treatment recommendations may also not be well known. For example, the American Society of Anesthesiologists practice guidelines for acute pain management in the perioperative setting (21) does not reference opioid-tolerant patients as a unique subpopulation warranting specialized treatment plans.

We were unable to demonstrate a relationship between use of long-acting opioids and in-hospital complications, LOS or post-discharge pain crisis requiring ER visitation or readmission, but we note that our study was not powered to address these questions and that it is possible that some of the patients in the long-acting opioid group may not have been opioid tolerant. However, the trend of higher readmission rates among non-opioid users is particularly surprising given the recently published observational study conducted by Gulur et al (14) regarding opioid-tolerant patients admitted for an acute episode of care. They found that among patients who were expected to be discharged within 10 days, those who were opiate tolerant required longer hospitalization and had greater 30-day readmissions than those who were not.

The main limitation of the present study was its retrospective nature. The use of retrospective data is dependent on the accuracy and completeness of the written record and prospective data collection is preferable. Furthermore, the research was conducted at a time when paper charts predominated and before the implementation of an electronic information system for the preoperative assessment, anesthetic record and acute pain service. Additionally, we excluded patients on short-acting opioid analgesics because it was not possible to accurately calculate the daily opioid dose, and we also relied on prescription data to calculate morphine equivalent daily dosage for patients using long-acting opioids; we cannot be certain that patients were taking their medication as prescribed. Selection bias may have occurred because some patients taking short-acting opioid medications on a regular and frequent basis may have been inadvertently excluded from the opioid-tolerant group. It is also possible that some patients in the long-acting opioid group may not have been opioid tolerant.

In summary, we found a high frequency of opioid use among surgical patients and this was especially concentrated in the orthopedic and neurosurgery services. Uptake of expert opinion regarding the perioperative management of acute pain in the setting of pre-existing opioid use was lacking. Despite this, there was no difference in LOS and postoperative adverse events requiring ER visits among the groups, although we found an unexpected trend of higher readmissions among patients who were not using opioids before their surgery. A larger prospective study is needed to further assess pain control, functional outcomes, patient satisfaction, LOS and complications in opioid-tolerant patients relative to opioid-naïve patients. The fact that

discharge was not delayed in patients using opioids does not necessarily mean that their pain was well controlled postoperatively, and the present study was not designed to explore this. Other outcome measures that may be of relevance in future studies include documentation of opioid requirements one year postoperatively. Future clinical research trials should focus on back and major joint surgeries because these groups were found to have the highest proportion of long-acting opioid use.

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students completing pain related research through The Ottawa Hospital Pain Clinic in memory of Dr Laurence Chiu, Staff Anesthesiologist, St Joseph's Hospital, Hamilton, Ontario.

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