Opioid information pamphlet increases postoperative opioid disposal rates: a before *versus* after quality improvement study

Un dépliant d'information sur les opioïdes augmente leur taux d'élimination postopératoire: une étude avant et après d'amélioration de la qualité

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Abstract

Purpose Half of postoperative patients are prescribed an opioid, but a majority do not store or dispose of them properly thus risking diversion. We examined the efficacy of an opioid educational pamphlet addressing opioid weaning, storage, and disposal. We hypothesized that the pamphlet would increase the rate of proper opioid disposal, storage, and weaning.

Methods This prospective before and after study was conducted at UBC Hospital in primary total hip or knee arthroplasty patients. Adults with American Society of Anesthesiologists physical class I–III, with no addiction history and consuming ≤ 30 mg of morphine equivalents daily were enrolled in the study. Two groups received similar standard management, except the intervention group additionally received the opioid education

pamphlet. Patients were contacted four weeks postoperatively to complete a survey. The primary endpoint was to evaluate proper opioid disposal rates. Secondary endpoints were to evaluate opioid storage and weaning rates.

Results Two hundred twenty-six patients were enrolled and 172 (76%) completed the survey. Among patients who had discontinued opioids, rates of proper disposal increased from 2/42 (5%) to 12/45 (27%) in those receiving the pamphlet (difference in proportions, 22%; 95% confidence interval (CI), 5 to 38; $P = 0.005$). Secure opioid storage did not improve in those receiving the opioid pamphlet [before, 18/86 (21%) vs after, 20/86 (23%); difference in proportions, 3%; 95% CI, –11 to 15; $P = 0.713$]. The proportion of patients weaned from opioids was unchanged by the pamphlet [before, 42/86 (49%) vs after, 45/86 (52%); $P = 0.735$].

Conclusion The introduction of an education pamphlet significantly improved self-reported proper opioid disposal rates in postoperative patients.

Author contributions Peter Rose, Jenni Sakai, Ruth Argue, Kevin Froehlich, and Raymond Tang were involved in the study design. Peter Rose, Jenni Sakai, and Ruth Argue were involved in data acquisition. Peter Rose, Kevin Froehlich, and Raymond Tang were involved in data analysis and manuscript preparation. Jenni Sakai and Ruth Argue were involved in manuscript revision.

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Résumé

Objectif Un opioïde est prescrit en postopératoire à près de la moitié des patients, mais la majorité d'entre eux ne les conserve pas ni ne les élimine de façon appropriée, ce qui expose au risque de détournement des médicaments. Nous avons examiné l'efficacité d'un dépliant éducatif sur les opioïdes, leur sevrage, conservation et élimination. Nous avons émis l'hypothèse que le dépliant augmenterait les taux de pratique adéquate d'élimination, conservation et sevrage aux opioïdes.

Méthodes Cette étude prospective avant et après a été menée à l'hôpital UBC avec des patients ayant subi une arthroplastie de première intention de hanche ou de genou.

Des patients classés I à III selon la classification physique de l'American Society of Anesthesiologists, sans antécédents de dépendance et consommant ≤ 30 mg/jour d'équivalents morphine ont été inclus dans l'étude. La prise en charge des deux groupes a été similaire si ce n'est que le groupe interventionnel a reçu en plus le dépliant éducatif sur les opioïdes. Les patients ont été contactés quatre semaines après l'opération pour répondre à l'enquête. Le critère d'évaluation principal était l'évaluation du taux d'élimination appropriée des opioïdes. Les critères d'évaluation secondaires étaient l'évaluation des taux de conservation et de sevrage des opioïdes.

Résultats Deux cent vingt-six patients ont été recrutés et 172 (76 %) ont complété l'enquête. Parmi les patients ayant interrompu les opioïdes, le taux d'élimination correcte est passé de 2/42 (5 %) à 12/45 (27 %) pour ceux qui avaient reçu le dépliant (différence de 22 %; intervalle de confiance à 95 % [IC], 5 à 38; $P = 0,005$). La conservation sécuritaire des opioïdes n'a pas été améliorée chez ceux qui avaient reçu le dépliant (avant, 18/86 [21 %] contre après, 20/86 [23 %]); différence de 3 %; IC à 95 %, -11 à 15; $P = 0,713$). Le pourcentage de patients sevrés de morphiniques n'a pas été modifié par le dépliant (avant, 42/86 [49 %] contre après, 45/86 [52 %]); $P = 0,735$).

Conclusion L'introduction d'un dépliant éducatif a significativement amélioré le taux d'élimination autorapporté des opioïdes chez les patients en postopératoire.

Prescription opioid use in Canada has tripled in the last decade, and Canada is the second largest consumer of opioids per capita in the world.^{1,2} Approximately 20% of Canadians have been prescribed an opioid in the past year, and another 5% admit to using opioid medications that were not prescribed for them.² The rates of addiction, overdose, and death attributed to opioids doubled from 13.7 per million in 1991 to 27.2 per million in 2004.³ Unfortunately, non-medical prescription opioid use accounts for 40% of these overdoses.²

Opioids are an accepted important therapy in the management of post-surgical pain. Half of all surgical patients are discharged with opioid prescriptions, and 3-5% continue these medications beyond the expected duration of postoperative pain.^{4,5} Up to 3% of patients undergoing major lower limb joint arthroplasty remained on opioids 58 months postoperatively.⁵ Although it is important to treat postoperative pain, the long-term use of opioids can be deleterious, with a reduced quality of life and an increase in morbidity, including an increase in cardiac events.⁶⁻⁸

Substantial portions of prescribed opioid medications go unused, and many patients do not dispose of them properly, risking diversion into the community.^{9,10} In fact, in some postoperative data, only 1% of patients appropriately return unused opioids to a pharmacy.¹⁰ Because up to 90% of post-surgical patients keep their unused opioids in their home, secure storage is important to avoid inadvertent ingestion by other susceptible individuals as well as diversion of opioids into the community.¹⁰ Recent studies revealed that only 9% of oncology patients and 0% of patients recently discharged from the emergency department with an opioid prescription stored opioids in a locked area.^{11,12} Published data are lacking to show that improper storage and disposal of opioid medications may be associated with an increase in opioid abuse, morbidity, or mortality; however, approximately 70% of those using opioids for non-medical purposes acquired opioids from friends or relatives prescribed these medications.¹³ Diversion in our youth population is a growing concern as 90% of addictions start during the teenage years, with 20% abusing opioids.¹⁴ Due to improper management of these medications, 72% of these addictions are initiated by teenagers obtaining opioids from their own home.¹⁴

Opioid use and misuse is increasing dramatically in Canada, and education of patients about appropriate opioid storage and disposal is an integral step in curbing the problem. Patients are rarely given sufficient information regarding safe use, storage, and disposal of opioids; therefore, it is incumbent on physicians to educate their patients on these issues prior to prescribing the drugs.¹⁵

The purpose of this study was to determine whether the introduction of a simple low-cost opioid education pamphlet would increase the rate of proper opioid storage and disposal and safe opioid weaning practices in patients undergoing elective primary hip and knee arthroplasty. A secondary purpose of this study was to add to the current body of data regarding opioid use and handling prior to any educational intervention.

Methods

Approval to proceed with this study was granted by the University of British Columbia (UBC) Clinical Research Ethics Board on August 22, 2014 (H14-02134) and by the Vancouver Coastal Hospital Research Institute on September 19, 2014 (V14-02134). All participants provided written informed consent prior to enrolment. Study team members obtained patients' consent preoperatively in person in the Anesthesia Consult Clinic and in the Preoperative Care Centre. We performed a telephone survey before and after the study to assess the

effect of an opioid education pamphlet on safe opioid storage and disposal as well as opioid weaning behaviour in postoperative lower limb total arthroplasty patients. The study was conducted at the UBC Hospital with enrolment and data collection from August 2014 to April 2015.

Patients over the age of 18 with an American Society of Anesthesiologists (ASA) physical status I-III and scheduled for a single total primary hip or knee arthroplasty at UBC Hospital were approached to participate. Exclusion criteria were an inability to communicate verbally by telephone, a contraindication to opioid medications, patients currently consuming ≥ 30 mg of oral morphine equivalent daily or with a history of opioid addiction; ASA IV or greater, and an indication for surgery due to malignancy.

Intervention

An opioid education pamphlet (Appendix 1; available as Electronic Supplementary Material) was developed by perioperative pain anesthesiologists and nurses. Final content was determined by consensus amongst the development team, other non-anesthesiologist physicians, nurses, and non-medical trained individuals. Educational domains targeted in the pamphlet included safe opioid storage, opioid weaning, and disposal. These domains were selected based on deficits in safe opioid handling and disposal reported previously as well as common questions that patients at our institution asked about opioid analgesics which did not seem to be adequately addressed by prescribers.¹⁰⁻¹² A formal evaluation of the pamphlet was not performed, but it was piloted in preoperative and postoperative patients to ensure that the content was at an appropriate reading level.

The participants were instructed to read the pamphlet in the postoperative period, and the research team gave no further opioid-related education information, written or verbal, in order to isolate any effect to the introduction of the pamphlet.

Study groups

Group assignment was based on the date of the scheduled arthroplasty. Participants with a surgical date from August to December 2014 were enrolled in the control group (usual care), while those with a surgical date from January to April 2015 were enrolled in the intervention group (usual care plus opioid education pamphlet). The opioid education pamphlet was introduced in January 2015. Aside from the intervention group receiving the opioid education pamphlet, both groups received identical surgical, anesthesia, and postoperative management.

Assessment

Participant demographics were recorded upon enrolment, including age, sex, surgical date, and surgery type. During postoperative week four, all participants were contacted to complete a telephone survey on opioid medication use, practices, and pain management. Participants were considered unavailable if they could not be reached in four telephone call attempts. The follow-up survey was a novel survey developed by the research team to assess opioid storage and disposal, opioid weaning, and postoperative pain management and to pose questions to define patient demographics (Appendix 2; available as Electronic Supplementary Material). The study team generated the survey items as there were no validated surveys in the current literature that addressed these issues. No formal development process was utilized for the questionnaire. Questions were generated by consensus of the research team (anesthesiologists and perioperative pain nurses), non-anesthesiologist physicians, and non-medically trained individuals to address three key points: opioid disposal, weaning, and storage. Proper opioid disposal and storage has been previously defined in the literature and questions were asked in that regard. The authors decided on the key points about weaning. Demographic data and pain control between groups were considered important to ensure similar characteristics between the cohorts, and standardized questions were posed to address these issues. Patients completed a pre-test of the survey to ensure good flow and comprehension; however, a pilot test of the survey was not performed.

The primary outcome of this study was the self-reported rate of proper opioid disposal, defined as either return of the unused medications to a pharmacy or crushing the medication and mixing it with a noxious substance before throwing the mix into the garbage. The secondary outcomes evaluated were self-reported rates of safe storage practices (stored in a locked area or medicine cabinet), successful weaning from opioid therapy, and patient satisfaction with the information about opioids and weaning.

Data analysis

The power calculation based on the ability to detect a 10% increase in proper opioid disposal from a population baseline of 1% disposing of opioids properly determined that 88 patients per group would be required ($\alpha = 0.05$, power 80%).¹⁰ A 10% increase was selected as this is a similar absolute improvement in opioid behaviours noted in other educational intervention studies.^{17,18} We anticipated a 60% survey response rate based on other surveys performed at our institution.

We summarized demographic data using percentages or means [standard deviation (SD)]. Group comparisons were evaluated with the assumption that patients who were given the opioid pamphlet actually retained and read it. Chi square tests were used to analyze categorical data, including demographics, opioid storage practices, opioid disposal practices, and yes or no survey responses, and we compared numeric variables using independent Student's *t* tests if distributions were normal. If the Kolmogorov-Smirnov test for normality of distribution was significant, we used non-parametric Mann-Whitney U tests. All reported *P* values are two-sided; statistical significance was assumed if *P* < 0.05.

Results

We enrolled 226 subjects in the study, 106 subjects prior to the introduction of the opioid education pamphlet and 120 following the intervention. No differences in demographics, education, or type of surgery were present between groups (Table 1). Five participants in each group admitted to recreational drug use; all occasionally used marijuana. Follow-up survey completion rates were 86/106 (81%) in those who did not receive the pamphlet (no pamphlet group) and 86/120 (72%) in those who received the pamphlet (pamphlet group). The remainder of the subjects could not be reached by telephone. All contacted participants completed the survey. There were 19/86 (22%) participants in the pamphlet group who denied receiving or reading it but were included in the final analysis. The pain experienced and reported in the perioperative and

postoperative period was not different between groups (Table 2).

At follow-up four weeks postoperatively, 42/86 (49%) subjects in the no pamphlet group and 45/86 (52%) subjects in the pamphlet group had ceased opioid use (difference in proportions, 3%; 95% CI, -12 to 19; *P* = 0.735). Of those no longer taking opioids, 2/42 (5%) in the no pamphlet group and 12/45 (27%) in the pamphlet group disposed of opioids safely (difference in proportions, 22%, 95% CI, 5 to 38; *P* = 0.005) (Table 3). All patients who disposed of unused opioids safely did so by returning them to a pharmacy. No subjects in either group crushed unused opioids (and mixed them with a noxious substance) prior to throwing them into the garbage. Safe opioid storage in a locked area or medicine cabinet did not differ between groups. No subjects in either group admitted to sharing or giving opioid medications to others.

Ease of weaning was rated on a scale of 0-10 (0 = extremely difficult and 10 = easy). Patients who had discontinued opioid use at the time of contact rated weaning difficulty with a mean (SD) of 9.3 (2.0) and 9.2 (1.4) in the no pamphlet and pamphlet groups, respectively (mean difference, 0.1; 95% CI, -0.4 to 0.6; *P* = 0.242). Patients continuing to take opioid medication at the time of contact rated weaning difficulty with a mean (SD) 8.3 (2.2) and 9.2 (1.2) in the no pamphlet and pamphlet groups, respectively (mean difference, 0.9; 95% CI, 0.4-1.4; *P* = 0.102). Withdrawal symptoms of sweating, fever, nausea/vomiting, agitation, or irritability occurred in 7/86 (8%) and 2/86 (2%) of the no pamphlet and pamphlet groups, respectively (difference in proportions, -6%; 95% CI, -2 to 14; *P* = 0.170). Satisfaction with information on opioid medications was rated on a scale of 0-10 (0 = unsatisfied and 10 = satisfied). Opioid information satisfaction scores improved from 6.2 (3.1) in the no pamphlet group to 7.8

Table 1 Population characteristics

Characteristic	No Pamphlet (%) or (SD)	Pamphlet (%) or (SD)
<i>n</i>	86 (100%)	86 (100%)
Mean Age	62 (10)	64 (10)
Male	40 (47%)	32 (37%)
Mean postoperative day of survey	29 (3)	29 (4)
Surgery Type		
Total Hip Arthroplasty	52 (60%)	60 (70%)
Total Knee Arthroplasty	34 (40%)	26 (30%)
Highest education		
Completed high school	15 (17%)	13 (15%)
Incomplete high school	2 (2%)	6 (7%)
Partial secondary degree	24 (28%)	17 (20%)
University/college degree	43 (50%)	44 (51%)
Rather not say	0 (0%)	2 (2%)
Recreational drug use	5 (6%)	5 (6%)
Anxiolytics/sleep aids	14 (16%)	18 (21%)

Table 2 Participant reported pain scores

Survey Item	Patient Reported Pain Scores*		Mean difference (95% CI)	<i>P</i> value
	No Pamphlet Mean	Pamphlet Mean		
Pain in hospital	8.0	7.7	-0.3 (-0.8 to 0.2)	0.679
Pain at discharge	7.9	8.0	0.1 (-0.3 to 0.5)	0.796
Current rest pain	1.9	2.2	0.3 (-0.1 to 0.7)	0.286
Current activity pain	4.2	4.4	0.2 (-0.3 to 0.7)	0.625

* Participants were asked to report pain scores as 0 being "no pain" and 10 being the "worst pain ever experienced". CI = confidence interval

Table 3 Self-reported opioid disposal and storage

Survey Item	No Pamphlet	Pamphlet	Difference in proportions (95% CI)
If disposed of, how did you get rid of the medication?(in those no longer taking opioids)	<i>n</i> = 42	<i>n</i> = 45	
Proper Opioid Disposal*	2 (5)	12 (27)	22% (5 to 38) <i>P</i> = 0.005)
Returned to pharmacy in those no longer taking prescribed opioids	2(5)	12(27)	
Crushed and then mixed with a noxious substance before disposal	0(0)	0(0)	
Threw in trash	0(0)	0(0)	
Flushed down toilet	0(0)	0(0)	
Gave to friend or relative	0(0)	0(0)	
Other	0(0)	0(0)	
Location of opioids at the time of telephone interview	<i>n</i> = 86	<i>n</i> = 86	
Safe opioid storage†	18(21)	20(23)	2% (−11 to 15) <i>P</i> = 0.713
In medicine cabinet or unlocked drawer	16(19)	19(22)	
In locked area	2(2)	1(1)	
On the counter, table/ out in the open	33(38)	18(21)	
On person, purse, backpack	0(0)	0(0)	
Disposed of them	2(2)	12(14)	
I don't know where they are	2(2)	0(0)	
Other	4(5)	2(2)	

Responses presented as number (%)

* Opioid return to the pharmacy and crushing of opioids prior to disposal combine to represent proper opioid disposal

† Safe opioid storage includes storage in a medicine cabinet or unlocked drawer or storage in a locked area

CI = confidence interval

(2.8) in the pamphlet group (mean difference, 1.6; 95% CI, 1.0 to 2.2; *P* = 0.029). Similarly, opioid tapering information satisfaction scores also improved from 3.0 (3.9) to 7.6 (3.2), respectively (mean difference, 4.6; 95% CI, 3.9 to 5.3; *P* < 0.001).

Discussion

The rate of self-reported proper opioid disposal was more than fivefold greater in patients receiving an opioid education pamphlet than in those with standard care. This difference remained significant despite the fact that 22% of participants in the pamphlet group denied receiving or

reading it. Reported safe opioid storage practices during the postoperative period and at follow-up were similar between groups. Successful opioid weaning and reported weaning difficulty were not different between groups. Nevertheless, patient-reported satisfaction with opioid information and opioid weaning information was significantly greater in those who received the pamphlet.

In our study, 5% of patients in the no pamphlet group reported returning unused opioids to a pharmacy. This baseline is similar to reported return rates from other populations: 8% of oncology patients, 6% of veterans, and 1% of postoperative urology patients.^{10,12,16} With the introduction of an inexpensive opioid education pamphlet, the self-reported rate of return increased to 27%, supporting our hypothesis that a simple pamphlet can alter patient behaviour. Comparable studies are lacking in surgical patients, yet two recent studies in non-surgical patients assessed the role of opioid education on patient knowledge.^{17,18} In one study, 274 patients discharged from the emergency department with an opioid prescription were randomly assigned to combined verbal and written opioid education or standard care. The educational intervention in these patients improved opioid knowledge and reduced the rate of driving while taking opioids.¹⁶ Another study evaluated opioid knowledge and misuse in 62 patients prescribed opioids. Patients were assessed before and after a web-based opioid education intervention. At one month follow-up, opioid knowledge improved and aberrant opioid behaviours were reduced.¹⁷ Neither of these studies addressed appropriate opioid disposal, a vital step in limiting opioid diversion. In addition, both studies involved interventions requiring significant cost and resources that may not be available to all care providers.^{17,18}

The dramatic increase in proper opioid disposal in our study and the reduction in risky behaviours documented previously with patient-directed education, including driving under the influence of opioids and borrowing and lending opioids, may highlight the lack of information on opioid management that prescribers provide patients in standard care.^{17,18} These studies also indicate that patients are inclined to manage opioids properly and return unused portions to the pharmacy if they are given the appropriate information. Our low-cost education technique had a significant impact on self-reported proper opioid disposal and can be easily reproduced at other centres and integrated into information provided to postoperative patients. Then again, three-quarters of the participants who received the opioid education pamphlet still failed to dispose of their opioids properly, suggesting that further interventions are required to address this problem. If this approach were combined with verbal reinforcement from prescribers, pharmacists, and other caregivers, the rate of return may be higher and further reduce the risk of diversion into the

community. Given the success of the opioid pamphlet in surgical patients, it may be reasonable to extrapolate some benefit in opioid disposal in those taking opioids for non-surgical pain. Requiring pharmacies to include a similar type of pamphlet with every opioid prescription may be an effective means to disseminate information. In addition, proper disposal rates may further improve if patients were given incentives to return opioids, for example, nominal remuneration from pharmacies or pharmaceutical industry sponsors.

Primary total hip and knee arthroplasty patients were studied because almost all of these patients are discharged with an opioid prescription, and the majority follow a predictable time course when their pain improves and they are weaned off opioids. The homogeneity of this population allows for any differences to be attributed to the intervention rather than to different pain intensities from a variety of surgeries with individualized postoperative care pathways. In addition, factors most strongly associated with prolonged postoperative opioid use, including younger age, use of specific medications (benzodiazepines, selective serotonin reuptake inhibitors), and recreational drug use did not differ between the groups and cannot be seen as confounders.⁴

We chose to conduct our follow-up telephone survey at four weeks postoperatively to ensure a higher follow-up rate, as patients are still involved with structured rehabilitation programs and less likely to be far from their home. As only half of our study population discontinued their opioids at four weeks, conducting the survey at six weeks may have yielded more patients off opioids to include in the opioid disposal analysis. Even though historic controls from other studies in patients without mobility issues do not suggest a higher rate of opioid return, one may speculate that, after six weeks, disposal compliance rates may be higher in both groups when patients become more mobile with their new prostheses.

A number of study limitations must be discussed. First, a controlled before and after study design was chosen rather than a randomized controlled trial. During the data collection period, there were no known changes to surgical, anesthesia, or nursing practices that we consider acted as confounders contributing to our results. This was a single-centre study, and we recognize that practices as well as the information provided to patients may differ amongst centres. That being said, our baseline rates of opioid return were within those previously reported, supporting the notion that our standard of care regarding the information provided on opioids is not significantly different from other centres.

With any research in an emerging field, validated tools are rarely available. As such, our questionnaire (Appendix

2) was developed for this study without prior validation to address key variables, including opioid disposal, storage, and weaning, while also including informative demographic items. In addition, like other self-reporting studies, we recognize that participants may falsely give appropriate responses to the survey questions. Specifically, opioid returns could not be corroborated with local pharmacies to confirm patient reports. Although the interviewers reassured all participants of their anonymity, there is the possibility that patients, especially those who received the pamphlet, may have responded in a biased manner.

Opioids are essential in the management of significant postoperative pain, yet opioid misuse and diversion is a significant problem in Canada. As providers, we often neglect to educate patients of the potential side effects of opioids, how to wean off these medications safely, and the detrimental effects opioids have when diverted into the community. This study highlights how a low-cost educational pamphlet, provided with minimal support of health care workers, significantly improved self-reported proper opioid disposal rates in postoperative patients. The pamphlet also improved patient satisfaction regarding opioid management information.

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Conflicts of interest None declared.

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