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Implementation of a Quality Improvement Initiative to Decrease Opioid Prescribing After Cesarean Delivery

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Abstract

Objective: To assess whether a multiphase, departmental quality improvement effort decreases opioid prescribing and increases multimodal analgesic use after cesarean delivery.

Methods: This is a prospective quality improvement study. In Phase 1 of the protocol, discharge providers implemented counseling regarding expectations for pain, typical need for opioids, and

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importance of multimodal non-opioid analgesic use, and employed shared decision-making to determine the number of opioids prescribed. Patients could select up to a maximum of 30 tablets of oxycodone 5 mg, (or equivalent opioid), lower than the previous routine discharge prescription of 40 opioid tablets. The primary outcome was the mean (standard deviation, SD) number of opioid tablets prescribed on discharge, with secondary outcomes including opioid refill rate within 30 days of discharge and rates of non-opioid analgesic prescriptions on discharge. In Phase 2, using these results, we adjusted the protocol's maximum opioid prescription to 25 opioid tablets, but no other aspects of the protocol were changed. All data were analyzed with t-test and chi-squared analyses.

Results: Data from 624 women who underwent cesarean deliveries were analyzed. Opioids, most commonly oxycodone, were prescribed after 95% of all cesarean deliveries. The mean (SD) number of opioid tablets prescribed decreased from 33.2 (9.3) to 26.5 (6.7), $p<0.01$, with the implementation of Phase 1, with no effect on the opioid refill rate, 8.9% vs 8.1%, $p=0.79$. These results allowed adjustment of the maximum recommended prescription to 25 opioid tablets, introducing Phase 2 of the study, during which the mean (SD) number of opioid tablets prescribed further decreased from 24.9 (7.5) to 21.5 (6.3), $p<0.01$, with no effect on the opioid refill rate, 6.3% vs 5.1%, $p=0.72$. Overall, this represents a 35% decrease in opioid prescribing ($p<0.01$). Rates of ibuprofen prescribing were 98% or higher throughout the study, but rates of acetaminophen prescribing increased from 32.6% before Phase 1 to 92.0% after Phase 2 ($p<0.001$).

Discussion: Implementation of a multiphase quality improvement protocol to decrease opioid prescribing, combined with iterative review of discharge data, resulted in a significant decrease in the number of opioid tablets prescribed after cesarean delivery.

Précis

Decreasing the quantity of opioids prescribed after cesarean delivery is feasible with tailored discharge counseling incorporating shared decision-making and iterative analysis of discharge data.

Introduction

Opioids are the mainstay of pain management after cesarean delivery, the most common inpatient surgery in the United States (1). In a nationwide survey of women undergoing cesarean delivery, 85% received an opioid prescription upon discharge but only consumed half of the median discharge prescription of 40 tablets. Moreover, a higher number of opioid tablets prescribed was not associated with improved pain control, higher patient satisfaction, or lower refill rates, but was associated with increased consumption (2). In a separate study, 75% of women discharged after cesarean delivery reported leftover opioids (3). These data suggest that opioid prescribing after cesarean delivery exceeds the number of tablets consumed, and strategies to decrease opioid prescribing while maintaining patient satisfaction are needed, especially as 1 in 300 women undergoing cesarean delivery becomes a persistent opioid user in the 12 months postpartum (4).

Recently, our group published a pilot study on a shared-decision making approach to opioid prescribing after cesarean delivery (5). We employed a tablet-based decision aid to enable

patients to choose the number of opioid tablets to be prescribed upon discharge. The median number of opioid tablets prescribed was reduced by 50%, from 40 to 20 tablets of oxycodone 5mg, with high satisfaction rates with outpatient pain management at 2 weeks postpartum.

In this article, we describe our departmental quality improvement effort to apply shared decision-making to opioid prescribing into routine practice and increase use of multimodal analgesia, and to implement a continuous quality improvement approach to iteratively decrease the number of tablets prescribed.

Materials and Methods

In June of 2016, the results of our previously published shared decision making study were disclosed to obstetric providers, and a departmental decision was made to decrease the routine opioid discharge prescription (5). The departmental standard of 40 tablets oxycodone 5mg (or equivalent opioid) was reduced to 30 tablets while allowing for clinical discretion to prescribe a lower or higher quantity. We chose 30 tablets as the initial lower prescription, as in our prior study, the mean number of tablets prescribed was 20, with a standard deviation of 10 tablets (5).

In order to achieve this goal, several simultaneous changes in postoperative pain management and counseling were instituted as part of a new protocol. First, we focused on provider-initiated counseling at time of discharge. To tailor discharge counseling, which focused on expectations for pain as an outpatient, the efficacy of non-opioid multimodal analgesia, and the typical need for opioids being 20 oxycodone 5mg tablets, a one-page handout was used as a guide by the discharging provider during counseling. This handout was based on the tablet-based decision aid from our group's prior study (Supplemental Appendix 1), and was professionally translated in Spanish, as several discharging providers are fluent in medical Spanish and many patients in our practice are Spanish-speaking (5). For all other languages, discharge counseling was performed over the telephone or using an in-person interpreter. An important aspect of discharge counseling incorporated shared decision-making between patient and provider regarding the number of opioid tablets desired, based on the patient's inpatient experience of pain and pain management. After the quantity was confirmed, patients were made aware of the state law passed in March 2016 which allows for partial fills of opioid prescriptions (6). Any opioids not dispensed and remaining on the prescription are void after the initial dispensation, and a patient must reinitiate care to obtain a new opioid prescription. Finally, ways to safely dispose of leftover opioids in the home was discussed during discharge counseling.

In addition, as multimodal analgesia has been demonstrated to decrease opioid consumption after cesarean delivery, we standardized the protocol for inpatient and outpatient prescribing of acetaminophen and ibuprofen, when no clinical contraindications existed (7). Whereas ibuprofen prescribing post-cesarean delivery is high, acetaminophen prescribing has historically been low (unpublished data) at our institutions. As such, inpatient postoperative pain management order sets were changed from as needed non-opioid analgesia, which was administered at random, to scheduled acetaminophen (to a maximum of 3000mg/day) and

nonsteroidal anti-inflammatory drugs (NSAIDs) (ketorolac, up to 120mg in the first 24 hours, followed by ibuprofen up to a maximum of 2400mg/day). As this represented a cultural shift in pain management for the ordering providers, commonly residents performing the cesarean delivery, and postpartum nurses, the efficacy of non-opioid multimodal analgesia were frequently emphasized.

We implemented this protocol using a Plan, Decide, Study, Act (PDSA) model, as this was a quality improvement effort. We had an *a priori* plan to analyze the impact of our protocol on the number of opioid tablets prescribed, the opioid refill rate within 30 days of discharge, and acetaminophen and ibuprofen prescribing rates at discharge. We were interested in the opioid refill rate as a proxy for inadequate outpatient pain control. Our goal was to further refine the maximum number of opioid tablets to be prescribed by iteratively analyzing the above outcomes. The protocol was implemented on November 7, 2016 (Phase 1). The period for data collection to evaluate the impact of the protocol change occurred from September 5, 2016 to November 6, 2016 (pre-Phase 1) and from November 7, 2016 to January 10, 2017 (post-Phase 1).

Given encouraging results after the first round of data analysis (described below), we shared these results with discharging providers, and the departmental protocol was adjusted to reduce the maximum prescription to 25 tablets of oxycodone 5mg (or equivalent opioid) (Phase 2). Data collection to evaluate the impact of this change was performed from May 14, 2017 to June 9, 2017 (pre-Phase 2) and from June 10, 2017 to August 14, 2017 (post-Phase 2). There were no other concurrent changes in the postpartum discharge protocol after Phase 1 was completed and before Phase 2 was initiated.

Data collection included sociodemographics, opioid prescribing and refill data, and data on acetaminophen and ibuprofen prescribing. All data was abstracted from the electronic medical record by one individual (HD) and entered into REDCap. We restricted the analysis to women having an uncomplicated cesarean delivery, defined as postoperative length of stay <7 days, without major medical complications (stroke, seizure, need for blood transfusion, venous thromboembolic disease, sepsis), and ~~(or)~~ without postpartum readmissions within 30 days of delivery. In addition, women with a current or prior opioid use disorder were excluded from this analysis. The mean (standard deviation, SD) and median (interquartile range, IQR) number of opioid tablets prescribed and opioid refill rate within 30 days of discharge was calculated for each time point. Among patients without a contraindication, acetaminophen and ibuprofen prescribing rates were calculated at each time point. Pre- and post data for Phase 1 and Phase 2 were separately compared by a 2-sided t-test (for continuous data with means) as well as a Wilcoxon rank-sum test (for continuous data with medians) or a chi-squared test (for categorical data) using Stata 14 (College Station, TX). A trend test was also performed for the opioid refill rate and acetaminophen prescribing rate across all 4 time points.

The Partners Human Research Committee (Boston, MA) waives review of quality improvement project for both their performance and publication.

Results

Overall, 624 women undergoing cesarean delivery at this institution during each of the time frames evaluated were included in this study, after excluding a total 19 women (3 with postoperative length of stay greater than 7 days, 7 with current or prior opioid use disorder, 8 with postpartum readmissions, and 1 with postoperative stroke) across all time frames. Consistent with our patient population, the mean maternal age was over 30 years, and over half of the population was Caucasian (Table 1). The median gestational age at delivery was 39 weeks, and the median postoperative length of stay was 4 days in both Phase 1 and 2.

During Phase 1 of the protocol, when tailored discharge counseling with shared decision-making, optimal use of multimodal analgesia, and a maximum of 30 opioid tablets were implemented, there were 174 cesarean deliveries available for analysis prior to protocol implementation (pre-Phase 1), and 182 cesarean deliveries post-protocol implementation (post-Phase 1). Before implementation of the protocol, 97.1% were discharged with an opioid; after Phase 1 was instituted, 95.1% were discharged with an opioid ($p=0.32$), 88.3% of which were oxycodone 5mg prescriptions (Table 2). We observed a decrease in the mean number of opioid tablets prescribed from 33.2 (standard deviation, SD, 9.3) to 26.5 (SD 6.7), $p<0.01$. The median number of opioid tablets prescribed also decreased from 30 (IQR 30–40) to 30 (IQR 20–30), $p<0.01$. During Phase 1, opioid refill rates were unchanged at 8.9% pre-Phase 1 implementation and 8.1% post-Phase 1 implementation ($p=0.79$) (Figure 1).

In Phase 2, when the protocol was amended to recommend a maximum of 25 tablets of oxycodone 5mg (or equivalent opioid), there were 83 cesarean deliveries available for analysis prior to implementation of Phase 2 (pre-Phase 2), and 185 cesarean deliveries available post implementation of Phase 2 (post-Phase 2). In Phase 2, 95.1% of women were discharged with an opioid prescription, and we observed a decrease in the mean number of opioid tablets prescribed from 24.9 (SD 7.5) to 21.5 (SD 6.3), $p<0.01$, without an impact on the opioid refill rate (Table 2). The median number of opioid tablets prescribed decreased from 30 (IQR 20–30) to 25 (IQR 20–25), $p<0.01$. Overall, the difference in the mean number of opioid tablets prescribed pre-Phase 1 (33.2) and post-Phase 2 (21.5) was statistically significantly different ($p<0.01$). The difference in medians between these time points comparison was also statistically significant different when examined non-parametrically ($p<0.01$). Across both phases and each time point, the trend test for the refill rate was nonsignificant ($p=0.16$), and the difference between the refill rate pre-Phase 1 and post-Phase 2 was also not statistically significantly different ($p=0.17$).

The proportion of women discharged with an acetaminophen prescription increased significantly during Phase 1, from 32.6% to 77.4%, $p<0.01$. Rates of acetaminophen prescribing were high but not significantly different pre- and post-implementation of Phase 2, 90.4% vs 92.0%, $p=0.68$ (Table 2). However, across all 4 time points, the almost threefold increase in acetaminophen prescribing was statistically significant ($p<0.001$). Consistent with departmental practices, ibuprofen prescribing rates at the time of discharge were high at all time points, and not statistically significantly different ($p>0.05$).

Discussion

Using a PDSA model to evaluate the implementation of a multipronged protocol to opioid prescribing after cesarean delivery, we observed a 35% reduction in the number of opioid tablets prescribed, without any impact on the opioid refill rate, and a significant increase in the acetaminophen prescribing rate. Implementing a simple, evidence-based protocol can have a substantial impact on mitigating the quantity of opioids prescribed.

A critical factor to the successful decrease in opioid prescribing lies in the cultural shift away from opioids as the first-line therapy for the treatment of pain for both patients and providers, augmented by the social awareness of the current opioid crisis. By emphasizing optimized use of NSAIDs and acetaminophen prior to opioid consumption during the inpatient hospitalization, patients had a multimodal framework established for managing pain as an outpatient. Educating patients at the time of discharge, and equally important, engaging them in the decision to prescribe a specific quantity of opioid tablets, were key aspects of the new discharge protocol. Our QI initiative built on an approach to opioid prescribing using shared decision-making that was developed at our institution. However, instead of using a tablet-based decision aid developed for the prior study, we used a single sheet that provided the most essential information from the tablet-based aid as the basis for a shared decision-making encounter. This allowed the shared decision-making session to occur in a more efficient manner, and may make the approach we piloted a more scalable intervention.

In a recent survey of American College of Obstetricians and Gynecologists (ACOG) Fellows, the median discharge prescription of opioids after cesarean delivery was 30 tablets, with a range of 8 to 60 tablets (8). The median opioid prescription in the multi-institutional survey study by Bateman et al was 40 tablets, with an interquartile range of 30–40, and in Osmundson et al's cohort was 30 tablets, with a range of 8 to 84 tablets; both studies reported a high proportion of leftover tablets (2,3). Although there is growing knowledge about the overprescribing of opioids, there are limited data on implementing strategies to decrease opioid prescribing in a non-research setting.

Strengths of this quality improvement project include the success of implementing the findings from our pilot study to all uncomplicated cesarean deliveries at our institution, suggesting the potential for this model to be generalizable to other institutions (5). Providers were aware of our intention to study the impact of all discharge recommendations, with a plan to iteratively decrease the maximum opioid prescription recommended. However, they were not aware of the dates during which data would be abstracted, suggesting that the chance of the findings being due to a Hawthorne effect is low.

We note limitations to our study. Although we were able to abstract opioid refills prescribed through this institution (through any department including Obstetrics), we do not know if patients sought, or received, opioid prescriptions from other institutions. However, internal data suggests that over 75% of patients delivering at this institution receive care during the postpartum period through our institution; thus, it is unlikely that a significant proportion of

patients sought care in the period immediately after their cesarean delivery outside of our institution.

Although we observed a decrease in the number of opioids prescribed, we cannot comment on the number of opioids dispensed, as state law allows for partial dispensation of opioid prescriptions. This ultimately influences the number of leftover opioids, which are a main source of opioid misuse and diversion (9). A corollary to our effort to decrease opioid prescribing was to decrease leftover opioids available in the community. Although we did not contact patients to determine how many leftover opioids they had, discharge counseling also included information on several routes of safe disposal available to patients in their community. Knowledge regarding the number of opioid tablets dispensed, as well as consumed, would also serve as valuable information to help inform opioid prescribing prior to discharge. We did not ascertain this data, as our quality initiative was aimed at improving institutional prescribing patterns.

As a result of our success in decreasing opioid prescribing after cesarean delivery, our current protocol has again been amended to recommend a maximum of 20 tablets of oxycodone 5mg (or equivalent opioid) prescribed at the time of discharge. This decrease, which represents a 50% decrease in the departmental standard prior to this study, has been successfully implemented in 18 months. In addition, efforts to optimize multimodal analgesic use continue both inpatient and upon discharge.

In summary, implementation of a multipronged departmental effort to decrease reliance on opioids for post-cesarean pain control paired with iterative analysis of opioid and non-opioid analgesic discharge data has resulted in a significant decrease in the quantity of opioid tablets prescribed after uncomplicated cesarean delivery.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Martin J, Hamilton B, Osterman M, Driscoll A, Matthews TJ. Births: Final data for 2015. *Natl Vital Stat Rep* 2017;66(1):1–70.
2. Bateman BT, Cole NM, Maeda A, Burns SM, Houle TT, Huybrechts KF, et al. Patterns of Opioid Prescription and Use After Cesarean Delivery. *Obstet Gynecol* 2017;130:29–35.
3. Osmundson SS, Schornack LA, Grash JL, Zuckerwise LC, Young JL, Richardson MG. Postdischarge Opioid Use After Cesarean Delivery. *Obstet Gynecol* 2017;130:36–41. [PubMed: 28594766]
4. Bateman BT, Franklin JM, Bykov K, Avorn J, Shrank WH, Brennan TA, et al. Persistent opioid use following cesarean delivery: patterns and predictors among opioid-naïve women. *Am J Obstet Gynecol* 2016;215(3):353.e1–353.e18. [PubMed: 26996986]
5. Prabhu M, McQuaid-Hanson E, Hopp S, Burns SM, Leffert LR, Landau R, et al. A Shared Decision-Making Intervention to Guide Opioid Prescribing After Cesarean Delivery. *Obstet Gynecol* 2017;130:42–6. [PubMed: 28594762]
6. Valentine AR, Carvalho B, Lazo TA, Riley ET. Scheduled acetaminophen with as-needed opioids compared to as-needed acetaminophen plus opioids for post-cesarean pain management. *Int J Obstet Anesth* 2015;24(3):210–6. [PubMed: 25936786]

7. Massachusetts State Law, Chapter 52 (2016). AN ACT RELATIVE TO SUBSTANCE USE, TREATMENT, EDUCATION AND PREVENTION. [Internet]. 2016 [cited 2016 Dec 1];Available from: <https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter52>
8. Madsen AM, Stark LM, Has P, Emerson JB, Schulkin J, Matteson KA. Opioid knowledge and prescribing practices among obstetrician-gynecologists. *Obstet Gynecol* 2018;131(1):150–7. [PubMed: 29215508]
9. Kennedy-Hendricks A, Gielen A, McDonald E, McGinty EE, Shields W, Barry CL. Medication Sharing, Storage, and Disposal Practices for Opioid Medications Among US Adults. *JAMA Intern Med* 2016;176(7):1027. [PubMed: 27295629]

Figure 1.

Run chart displaying timing of interventions and effect on opioid prescribing. The change in the mean number of opioid tablets prescribed between prephase 1 and postphase 2 was significant, $P < .01$. The change in the opioid refill rate between prephase 1 and postphase 2 was not significant, $P = .17$.

Table 1.**Demographics**

	Phase 1		Phase 2	
	Pre (n=174)	Post (n=182)	Pre (n=83)	Post (n=185)
Maternal age, mean (SD)	33.3 (4.9)	34.3 (5.1)	32.8 (5.3)	33.5 (4.8)
Ethnicity, n (%)				
Hispanic	32 (18%)	38 (21%)	17 (20%)	41 (22%)
Race, n (%)				
Caucasian	96 (55%)	93 (51%)	49 (59%)	110 (59%)
Black	22 (13%)	30 (16%)	6 (7%)	18 (10%)
Other	51 (29%)	56 (31%)	27 (33%)	51 (28%)
Missing	5 (3%)	3 (2%)	1 (1%)	6 (3%)
Gravidity, median (IQR)	2 (1–3)	2 (1–3)	2 (1–3)	2 (1–3)
Parity, median (IQR)	1.5 (1–2)	2 (1–2)	1 (1–2)	1 (1–2)
Gestational age at delivery, median (IQR)	39 (38–40)	39 (38–39)	39 (38–39)	39 (37–39)
Postoperative length of stay, median (IQR)	4 (4–4)	4 (3–4)	4 (3–4)	4 (3–4)

SD: standard deviation

IQR: interquartile range

Table 2.

Opioid prescribing, non-opioid analgesia prescribing, and opioid refill rate, by study phase.

	Phase 1			Phase 2		
	Pre (n=174)	Post (n=182)	<i>p</i>	Pre (n=83)	Post (n=185)	<i>p</i>
Opioid prescribing						
Opioid prescribed, n (%)	169 (97.1%)	173 (95.1%)	.32	80 (96.4%)	175 (94.6%)	.53
Oxycodone 5 mg, n (%)	145 (85.7%)	157 (90.7%)	.27	73 (91.3%)	164 (93.7%)	.49
Hydromorphone 2 mg, n (%)	23 (13.6%)	16 (9.3%)	.20	7 (8.8%)	11 (6.3%)	.53
Hydrocodone 5 mg, n (%)	1 (0.6%)	0 (0%)	.31	--	--	
Opioid tablets ^a prescribed, mean (SD)	33.2 (9.3)	26.5 (6.7)	<.01	24.9 (7.5)	21.5 (6.3)	<.01
Opioid tablets ^a prescribed, median (IQR)	30 (30–40)	30 (20–30)	<.01	30 (20–30)	25 (20–25)	<.01
Non-opioid analgesia prescribing						
Acetaminophen prescribed, n (%) ^b	56/172 (32.6%)	140/181 (77.4%)	<.01	75/83 (90.4%)	170/185 (92.0%)	.68
Ibuprofen prescribed, n (%) ^b	166/168 (98.8%)	169/170 (99.4%)	.55	79/81 (97.5%)	173/174 (99.4%)	.19
Opioid refills						
Refill rate within 30 days of discharge, n (%)	15 (8.9%)	14 (8.1%)	.79	5 (6.3%)	9 (5.1%)	.72

SD: standard deviation

IQR: interquartile range

^aOxycodone 5mg or hydromorphone 2mg; 1 patient with hydrocodone 5mg prescription excluded^bDenominator reflects the proportion of patients without a contraindication to the drug