



## Reducing Opioid Prescriptions in Outpatient Pediatric Urological Surgery

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**Purpose:** We assessed the impact of a 2-phase Plan-Do-Study-Act cycle to decrease opioid prescriptions following pediatric urological surgery.

**Materials and Methods:** Parents of children undergoing outpatient urological procedures were given questionnaires to assess opioid dosing and pain scores using the Parents' Postoperative Pain Measure scale. Age, procedure and opioid prescription data were recorded, as well as volume of medication administered. During the first phase of data collection children received an opioid prescription for 10 doses. In the second phase opioid prescriptions were reduced by 50%. Nonparametric tests and Fisher exact test were used for analysis.

**Results:** Of 250 eligible children 98 (39%) with a median age of 3.0 years (IQR 7.0) participated. In the 81 patients prescribed opioids a median of 2 doses (IQR 3.6) were used in the preintervention and postintervention groups ( $p = 0.68$ ). Using nonparametric statistical testing, no significant differences were found between pain scores in the 5-dose group (31 patients) and the 10-dose group (24 patients;  $p = 0.05$  for day 1,  $p = 0.07$  for day 2,  $p = 0.06$  for day 3). There was no association between age and percent opioid used ( $p = 0.83$ ). There were no significant differences in median pain scores or median doses among procedure types.

**Conclusions:** In outpatient pediatric surgical practice opioid prescriptions can be decreased without increasing pain scores. Physician prescribing practices may contribute more to opioid consumption than actual pain patterns.

**Key Words:** pediatrics; urologic surgical procedures; analgesics, opioid; pain, postoperative

PAIN management in children is vital and necessary for a successful recovery following surgery. However, understanding and treating pain is a complex topic that is further complicated in children, who may be unable to verbalize their pain. Adequate pain control is essential since inappropriate control can cause undue stress, behavioral disturbance, disordered sleep and parental dissatisfaction in the postoperative period.<sup>1,2</sup> However,

prescribing opioids in excess of what is needed can lead to misuse of unused prescription opioids. Finding a balance between adequate pain management and safe and appropriate use of prescription opioids in children is critical but has yet to be achieved in outpatient pediatric urological surgery. Standards have not yet been determined or adopted. One survey of Society for Pediatric Urology members found that 53% of providers did

### Abbreviations and Acronyms

PDSA = Plan-Do-Study-Act

POD = postoperative day

PPPM = Parents' Postoperative Pain Measure

QI = quality improvement

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Study was deemed exempt from institutional review board approval (171754QI).

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not report an age limit for prescribing postoperative opioids, whereas 26% required patients to be older than 6 months.<sup>3</sup> Additionally this practice patterns survey revealed there was no clear consensus regarding pain management for common procedures in pediatric urology.

There has been increasing attention to the role physician prescribing has had in the widespread availability of prescription opioids in the community and the current opioid misuse/abuse epidemic. One study from the adult literature identified younger age and inpatient surgery as risk factors for opioid dependence.<sup>4</sup> In the adult literature it has also been noted that postsurgical patients are 4 times more likely to receive a prescription for opioids than nonsurgical patients.<sup>5</sup> In addition, more refills and weeks of opioid prescriptions have been associated with an increase in misuse among opioid naive patients.<sup>5</sup>

The CDC (Centers for Disease Control and Prevention) has identified prescription opioids as a driver of the current opioid epidemic and reports that the amount of prescription drugs sold in the United States nearly quadrupled from 1999 to 2014.<sup>6</sup> In recent studies on morbidity and mortality Seth et al noted that 66.4% of drug overdoses in 2016 involved an opioid,<sup>7</sup> of which more than 40% involved a prescription opioid.<sup>8</sup> The rate of overdose deaths attributed to opioids in 2016 was 5 times higher than in 1999.<sup>9</sup> Analysis and modification of physician prescribing patterns through QI initiatives afford us the opportunity to reduce access to prescription opioids. We hypothesized that narcotics are being overprescribed and particularly that providers prescribe more narcotics than patients are actually using. We prospectively assessed prescription patterns for outpatient pediatric urological procedures at an active academic pediatric urology practice to identify opportunities to decrease opioid prescriptions while maintaining patient pain control.

## METHODS

As part of a QI initiative to reduce narcotic medication prescription in outpatient urological surgery, we performed a PDSA cycle. This investigation (No. 171754QI) was found to be consistent with a quality improvement project and deemed exempt from institutional review board approval.

The division of pediatric urology staff at our institution consists of 4 attendings and 1 junior attending. At the outset of our study pain management for outpatient procedures had already been standardized among providers to 10 doses of opioids to cover 3 days of postoperative pain if opioids were prescribed. Only 1 provider did not routinely prescribe narcotics for all children undergoing outpatient procedures.

The goal of the QI initiative was to decrease the amount of narcotic prescriptions by at least 25%. Minor

surgical cases were targeted in this initiative, including orchiopexy (inguinal), inguinal hernia repair, scrotal orchiopexy, and circumcision and other penile cases. Hypospadias was excluded given the inconsistent need for a urethral stent and the additional medications prescribed, including antibiotics and anticholinergics. Our division performed 1,100 to 1,200 surgical procedures between 2016 and 2017, and the type of cases included in the study represent 70% of the total volume. All patients age 6 months to 18 years old undergoing the aforementioned surgeries during the 2 PDSA phases that took place between March and December 2017 were eligible to participate in the study.

The validated PPPM was used to assess pain scores for 5 days postoperatively. PPPM is a 15-item checklist that asks questions about the behavior of the child as a measure of postoperative pain.<sup>10</sup> This pain assessment tool was selected based on a systematic review<sup>11</sup> and for the ability to use 1 questionnaire uniformly across various age groups since it can be used for younger, nonverbal children as well as older children. A score of at least 6 (of 15) on the PPPM at any point indicates clinically significant pain.

To analyze whether the opioid doses prescribed could be reduced, parents were asked to record how many doses were used daily along with daily PPPM scores. Parents were also asked to bring any unused opioid medication to the postsurgical nurse visit, which took place within 7 to 10 days postoperatively, and the amount of unused opioid medication was obtained to determine the amount of opioid medication used. Findings from the initial PDSA phase were used to determine that an opioid dosing decrease of 50% (5 doses) was an appropriate target for the second phase.

Patient age, type of surgery and doses prescribed were extracted from the electronic health record. Whether the parents had called the nurse triage line for pain related issues was also recorded, as well as whether any further narcotics were prescribed to supplement the initial doses given.

Nonparametric Spearman rho, Mann-Whitney U and Kruskal-Wallis tests were used to analyze relationships among the nonnormally distributed continuous variables. Fisher exact test was used to analyze associations between groups based on categorical variables.

## RESULTS

In the initial phase 47 of 100 eligible patients (47%) with a median age of 3.0 years (IQR 7.7) returned questionnaires. One patient was excluded because he had undergone hypospadias repair, leaving 46 for analysis. Ten narcotic doses were prescribed per patient per practice standard for 41 patients, and 5 did not receive a prescription. Kruskal-Wallis test determined there was no statistically significant difference in median prescribed narcotic medication used by patients according to procedure type (penile 44%, inguinal 40%, scrotal 16%;  $p = 0.39$ ). Median daily PPPM scores steadily decreased, with the highest median score being 6.0 (IQR 4.8) on POD

0 (table 1). Highest median daily narcotic dose was 1 (IQR 2) on POD 0, with a steady decline thereafter. Overall, patients used a median of 27% (IQR 29%) of the prescribed medication in the first phase.

Based on data from the initial phase, during the second phase standard opioid dosing was reduced by 50%, with 5 narcotic doses being prescribed per patient. In the second phase 52 of 150 eligible patients (35%) returned the questionnaire, of whom 40 (77%) had received an opioid prescription. Patients in both phases used a median of 2.0 doses (IQR 3.6).

Across both phases 98 of 250 patients (39%) with a median age of 3.0 years (IQR 7.0) returned the questionnaires. A total of 17 patients (17%) were not prescribed narcotic medications, and no patient required a refill opioid prescription. Only 1 patient called the nurse triage line for pain. This patient had received a prescription for 5 opioid doses and did not require additional opioid pain medication.

Overall, inguinal procedures were performed in 39 patients, penile surgery in 43 and scrotal procedures in 16. There were no significant phase differences (10-dose vs 5-dose) in procedure type (Pearson chi-square test,  $p = 0.71$ ), median percent doses used (Mann-Whitney U test,  $p = 0.26$ ) or average PPPM scores on POD 0 to 2 (table 2). Median age of those prescribed opioids (4.0 years, IQR 7.5) was older compared to those who were not prescribed opioids (1.0 year, IQR 1.65; Mann-Whitney U test,  $p < 0.001$ ). However, there was no association between age and percent opioid used among those who received a prescription (Spearman rho -0.02,  $p = 0.83$ ). There was no increase in PPPM scores with the opioid dose decrease. In fact, median PPPM scores were lower in the reduced dosage group on PODs 1, 2 and 3 (table 1). Median PPPM scores on POD 3 were higher in patients who underwent penile surgery compared to inguinal surgery ( $p = 0.01$ , table 2), although they were well below a score considered to indicate significant pain. Caudal anesthetic block at surgery did not affect

whether an individual received a narcotic prescription (Fisher exact test,  $p = 0.07$ ), reported number of doses taken ( $p = 0.43$ ) or PPPM score ( $p = 0.92$  for POD 0,  $p = 0.40$  for POD 1,  $p = 0.82$  for POD 2,  $p = 0.35$  for POD 3).

## DISCUSSION

Given the recent opioid epidemic in the United States, our institution assembled an Opioid Abuse Prevention Task Force to identify strategies for mitigating opioid overprescription. As part of that initiative, the division of pediatric urology sought to analyze and modify opioid prescription patterns to decrease overall opioid prescriptions.

Appropriate postoperative pain management in children is an important clinical issue since parents are often anxious about pain in the postoperative period. Stewart et al studied pain severity and analgesia requirements following various outpatient pediatric surgeries.<sup>12</sup> They found low levels of postoperative pain after inguinal hernia repair but more severe and prolonged pain following orchiopey. They also observed correlating differences in pain medication taken.

Our study showed no significant differences among surgery types regarding PPPM scores on all postoperative days. Data from our cohort demonstrated that pain scores were generally low and below the threshold for clinically significant pain (score of 6) by POD 1. Nevertheless, we observed that parents administered opioids despite average PPPM scores not reaching the threshold of clinically significant pain. Moreover, PPPM scores did not increase despite a reduction in the number of doses prescribed, and PPPM scores in patients who did not receive opioid medications were also low. Only 1 patient called the nursing line for pain, which can be used as a surrogate to measure that enough pain medication was prescribed to alleviate significant patient discomfort even in the decreased dose group.

**Table 1.** PPPM scores and opioid doses by study phase

	Median Pain Score (IQR)	p Value*	Median No. Doses (IQR)	p Value*
POD 0:		0.39		0.68
Phase 1	6.00 (6.3)		1.00 (1.0)	
Phase 2	5.00 (7.0)		1.00 (2.9)	
POD 1:		0.05		0.18
Phase 1	4.00 (6.0)		1.00 (2.0)	
Phase 2	1.00 (3.5)		0.00 (1.0)	
POD 2:		0.07		0.13
Phase 1	3.00 (3.5)		0.00 (1.0)	
Phase 2	1.00 (3.0)		0.00 (0.0)	
POD 3:		0.06		0.13
Phase 1	1.50 (4.3)		0.00 (0.0)	
Phase 2	0.00 (2.0)		0.00 (0.0)	

Phase 1 included 24 patients, and phase 2 included 31 patients.

\* Kruskal-Wallis nonparametric test.

**Table 2.** PPPM scores and opioid doses by procedure

	Median Pain Score (IQR)	p Value*	Median No. Doses (IQR)	p Value*
POD 0:		0.21		0.99
Inguinal	3.00 (4.5)		1.00 (2.0)	
Scrotal	6.50 (5.4)		1.00 (1.3)	
Penile	7.00 (6.5)		1.00 (2.0)	
POD 1:		0.86		0.67
Inguinal	1.00 (4.5)		0.50 (1.8)	
Scrotal	3.00 (5.8)		0.25 (1.0)	
Penile	3.75 (5.4)		0.50 (1.8)	
POD 2:		0.40		0.85
Inguinal	0.00 (1.8)		0.00 (1.0)	
Scrotal	2.00 (3.0)		0.00 (1.0)	
Penile	4.25 (5.0)		0.00 (1.0)	
POD 3:		0.01		0.89
Inguinal	0.00 (0.5)		0.00 (0.0)	
Scrotal	1.25 (3.3)		0.00 (1.0)	
Penile	2.00 (5.3)		0.00 (0.0)	

Inguinal surgery was performed in 18 patients, scrotal surgery in 9 and penile surgery in 28.

\* Kruskal-Wallis nonparametric test.

Although our study did not assess for this factor, patients not receiving a prescription for opioids did not require a prescription for opioid medications at a later date. These cases were managed by acetaminophen and ibuprofen for pain control in the postoperative period. We also found that children undergoing penile surgery had higher PPPM scores than those undergoing inguinal surgery, and children older than age 5 years were more likely to use opioid than younger children. These data can be used as a starting point for setting objective parameters for opioid prescriptions in outpatient pediatric urological surgery.

We observed reduced opioid dosing and significantly trending lower pain scores by POD 3 in patients prescribed 5 vs 10 opioid doses. These findings suggest there may be an element of physician prescribing practices driving patient opioid consumption. If present, this phenomenon is important to note given the concern regarding postoperative opioid misuse and abuse that has been noted in the adult and pediatric literature. A recent study revealed a small (3% to 15%) but present risk of persistent opioid use in adolescents and young adults following surgery (defined as still using opioids at 3 to 6 months postoperatively).<sup>13</sup>

Our study is not without limitations. Although we report patient behaviors and self-assessments under 2 different dosing conditions, we did not perform a randomized controlled trial of dosing schedules and thus cannot conclusively stipulate that either schedule is superior to the other. Also, while we had a robust number of questionnaires returned, the response rate was less than 40%, and thus the results may not be fully representative of the entire population eligible for study. Once further stratified by pretreatment and posttreatment groups, there was limited statistical power.

Despite its advantages, the PPPM has inherent limitations, including length of the questionnaire, which could have contributed to a lower response rate. Also, parents may have experienced survey fatigue during the required 5 days of participation while attending to a postoperative child. Additionally the PPPM is validated for use in patients age 1 to 12 years old and thus may not be valid for those in our study outside that age range. However, the PPPM score was chosen to represent an objective measure of pain in an effort to use only 1 tool since it can be used for verbal and nonverbal patients alike.

Another limitation is the potential for a Hawthorne effect, whereby patient counseling could have differed between the 2 phases due to provider participation in the study, possibly affecting patient use patterns. Patient counseling was determined by provider preference and thus likely differed among physicians. There was also an unequal distribution of surveys returned based on provider. One provider who did not routinely prescribe opioids to patients younger than age 8 years saw a higher rate of survey return in the second phase of the study, which we cannot explain at this time.

Despite its limitations, this study not only examined prescription patterns, but also collected important objective data on postoperative pain scores for 3 of the most common surgical procedure classifications in pediatric urology using a validated tool. Based on these data, we noted that patients on average used less than 3 doses of prescribed opioid medications and average pain scores remained low despite a decrease in the prescribed amount.

## CONCLUSIONS

We report postoperative pain scores and opioid dosings for 4 of the most common minor surgical procedures in pediatric urology using a validated

tool. In our evaluation patients used fewer than 3 doses of prescribed opioid medications, regardless of whether 5 or 10 doses were prescribed, and average pain scores remained low despite reduction in the prescribed amount. These findings suggest that use of opioids can be decreased without increasing pain

scores. Our data also suggest that physician prescribing practices may contribute more to opioid consumption than actual pain patterns. Our results provide a starting point from which to set objective parameters for opioid prescriptions in outpatient pediatric urological surgery.

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## EDITORIAL COMMENT

The authors implemented a QI initiative to reduce written opioid prescriptions following outpatient pediatric urological procedures. The response rate was 39% using a validated postoperative pain measurement tool. The initial phase showed that only one-third of the prescribed pain medication was used across all ages, and POD 0 was associated with the highest median pain scores. Use of medicine and recorded pain scores declined during the days following surgery, which prompted the second phase where patients were prescribed 50% fewer narcotic doses. The limitations are well documented and include a potential lack of statistical power to detect significant differences between the treatment groups.

The important take home message is that physician practice patterns may be a major source determining the amount of opioids given to any patient following surgery. Information such as this highlights our ability to obtain meaningful objective

data (PPPM scores) from parents concerning pain in an outpatient setting. These data should be combined with best practice policies to drive standard outpatient postoperative processes across all surgical specialties. This study provides positive data to support the responsible use of postoperative nonsteroidal anti-inflammatory drugs as opposed to opioids for many of the surgeries we perform. The opioid epidemic is widespread and multifaceted. Quality improvement initiatives such as this underscore the important role surgeons can have in helping to change practice patterns, educate parents and drive down the unnecessary use of opioid prescriptions.



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