Journal of Pediatric Surgery 56 (2021) 506–511

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Factors affecting opioid management for injured children after hospital discharge☆

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ARTICLE INFO

Article history:
Received 10 January 2020
Received in revised form 8 October 2020
Accepted 15 October 2020

Key words:
Pediatric trauma
Opioid prescription
Opioid storage
Opioid disposal
Opioid education, opioid stewardship

ABSTRACT

Introduction: Prescription opioid misuse is a national crisis. Injured children often receive opioid medication at hospital discharge, but the role these prescriptions play in the opioid crisis has not been fully elucidated. Whether these opioids are administered, the duration of severe pain requiring opioids, and what the final disposition of unused opioids is in this population remain unknown.

Methods: A survey of parent/guardian perceptions of their child's pain after injury, duration of opioid administration, opioid storage and disposal, and perceptions of opioid education was designed. During a 12-month period, parents of injured children admitted to an ACS Level 1 Pediatric Trauma Center were prospectively enrolled by convenience sample. Surveys were in two steps with an enrollment survey prior to discharge and a follow-up survey 7–10 days after discharge.

Results: Seventy of 114 (61.4%) enrolled parents/guardians completed follow-up survey. Of the 79.1% that reported an opioid prescription for their child, 92.5% filled it. Of those reporting on opioid usage, 10.4% never used the opioid, 75% used opioids <3 days, 12.5% 4–7 days, 2% >7 days. Of those who filled the opioid prescription, 83.7% reported having leftover doses. Reasons for discontinuing opioids included the child no longer had pain (87.2%), the child ran out of medication (5.1%), other (7.7%). Regarding storage, 53.3% reported utilizing an unlocked bathroom cabinet, and 81.3% unlocked kitchen space. Of those reporting unused opioids, 83.3% reported not disposing them, and 38.2% reported no plan for disposal.

Conclusion: The majority of parents/guardians of injured children report resolution of severe pain requiring opioids within 72 h of hospital discharge, and virtually all by 7 days. The majority of injured children were prescribed a greater number of doses than they needed to treat their pain. Many parents/guardians store opioids in unsecure locations and a significant proportion report no plan to dispose of unused opioid doses. Further investigation is warranted to quantify and address the gap between pain control needs and opioid prescribing practices. The rate of unsecure storage and plan to retain unused opioids are potential targets for discharge opioid education.

Type of study: Cross-sectional survey.

Level of Evidence: Level IV.

Prescription opioid misuse is a national crisis [1]. After injury or surgery, pediatric patients are often prescribed opioid pain medications or benzodiazepines, but without well-defined best practice guidelines [2]. Parents and guardians are usually not medically trained and subsequently become untrained managers of controlled substances for their opioid naïve children [3]. It remains unknown whether medications from filled opioid prescriptions are administered, the duration of severe pain requiring opioids, and how unused opioids are managed in this population.

A previous retrospective review of injured children at our Level 1 Pediatric Trauma Center found that 65% of children were prescribed a narcotic (opioid and/or benzodiazepine) at discharge, yet 36% did not fill their prescription when prescription filling data was assessed in the state electronic prescription monitoring system (unpublished data, Wills 2016). Additionally, there was a significant trend toward younger children not filling their prescriptions, as only 50% of prescriptions for those ages 0–6 years were filled. Due to the retrospective nature of that review, it was unclear whether the rate of unfilled prescriptions

☆ Acknowledgements: Christina McRoberts, RN, BSNKim Duncan, RN, BSN, CCRCCarole Spake, MS

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https://doi.org/10.1016/j.jpedsurg.2020.10.016
0022-3468/

represented over-prescribing and/or underutilization of narcotics. It was also unknown what happened to unused medications, and whether caregivers are engaging in safe storage and disposal practices. Furthermore, analysis of the actual prescriptions provided found that there was a very wide range of dosing, number of doses, durations of treatment, and utilization of non-opioid pain medication. Duration of narcotics prescribed at discharge ranged from 1 day to over 1 month. The retrospective study design prevented analysis of patient and parent factors which may have influenced the use of narcotic medication and duration of treatment. Furthermore, very few patients had additional narcotic prescriptions filled in the 6 months after discharge for injury.

While effective, opioids carry significant risks of side effects, including death from overdose [4]. Causes of misuse are multifaceted and include providing excess quantities of opioids beyond what is actually needed for pain control, unsafe and unsecure storage of pain medication, and retention of pain medication in the home after the pain episode is over. It is unknown what role, if any, the opioids prescribed to injured children at hospital discharge play in the national epidemic of opioid misuse. In this study, we sought to prospectively assess parent and guardian perceptions of their child's pain and duration of need for opioid medication, reasons for filling or not filling opioid prescriptions, practices of opioid storage and disposal, and perceptions of opioid education provided prior to hospital discharge.

Our primary aim was to compare perceptions that parents/guardians had of their child's pain and need for opioid pain medication with the qualitative quantity of opioids prescriptions filled (too much, just right, too little). Our secondary aims were to identify parent/guardian rationale for filling or not filling opioid prescriptions, to identify the parent/guardian perceptions of whether they had received discharge opioid education, and to identify parent/guardian practices for opioid storage and disposal. We hypothesized that injured children at our medical center were being prescribed opioid medication in excess of their pain needs, that reasons for filling pain medication were not driven by their child's actual pain control needs, that parent/guardian perceptions of opioid education were not consistent with the education provided prior to hospital discharge, and that parents/guardians were not following current recommendations for safe opioid storage and disposal.

1. Methods

We conducted a prospective survey of a convenience sample of parents and guardians of children ages 0–17 years who were being discharged to home after inpatient admission to a Level 1 Pediatric Trauma Center in New England. The routine discharge education process was maintained throughout the study period. This process consisted of having the nurse discharging the patient provide standardized educational handouts from the electronic medical record system for new medication prescriptions. Neither the educational discussions by the nurses or the prescribing medical providers nor the timing of education relative to discharge were standardized.

Potential study subjects were identified daily from the inpatient hospital trauma census and screened for eligibility. Parents and guardians were excluded if they did not speak English as a primary language; their children were incarcerated, institutionalized, or wards of the state; their children were being evaluated for suspected child maltreatment; their child was admitted for self-injury; or their child had a condition that requires chronic opioid medication use for pain management. When a member of the research team was available and the patient was deemed medically stable by the medical providers, parents were approached for enrollment. Enrollment occurred over a 12-month period from June 1, 2017 to May 30, 2018. Patients were offered a $5 gift card at enrollment.

After written consent was obtained, an initial survey was given to the parent or guardian before hospital discharge (Supplementary Table 1). The initial survey assessed parent/guardian and patient demographics, socioeconomic metrics, and education level and whether the child had any prior opioid pain medication exposure. A subsequent survey was administered via phone call or email 7–10 days after discharge from the hospital, assessing whether opioid prescriptions were provided and filled, and reasons for filling or not filling; perceived duration of severe pain and duration of opioid use; reasons for discontinuing opioids; storage and disposal of opioid medication; and perceptions of opioid education provided at hospital discharge (Supplementary Table 2).

The surveys were built in SurveyMonkey Pro (SurveyMonkey, San Mateo, CA, USA) a web-based platform which allows electronic survey design, administration, data collection, and generation of descriptive statistics. The survey question sequence was designed using skip logic to present each respondent with questions relevant to their prior answers. The survey question sequence was designed using skip logic to present each respondent with questions relevant to their prior answers. Statistical analysis included frequencies and proportions of responses. The institutional review board of Lifespan Corporation approved the study (#1060890–10).

2. Results

Of 398 patients admitted to the trauma center, 110 were excluded (Fig. 1). Of the 288 eligible for enrollment, 114 (39.6%) were enrolled and completed the first survey. Seventy of 114 (61.4%) enrolled parents completed the follow-up survey. Patient age and parent/guardian demographics, highest educational level, employment status, and annual household income are shown (Table 1).

Of 67 parents or guardians that reported whether opioid prescriptions were given to them at discharge, 53 (79.1%) said they received an opioid prescription. Of those 53 who received opioid prescriptions, 49 (92.5%) reported filling the prescriptions. When asked the reason for filling, nearly all parents filled the opioid prescription for relief of their child's pain (95.9%) and most reported a healthcare provider advising them to fill the prescription (69.4%). Very few parents or guardians reported the patient requesting the medication for pain (4.1%) as a reason for filling. No parent reported financial barriers to filling the opioid prescriptions.

Forty-eight parents or guardians reported duration of opioid use, of whom 10.4% reported their child never used the opioid medication. The majority of respondents (75%) reported their children stopped using the opioid medication within 3 days of discharge, and an additional 12.5% reported use for 4–7 days (Fig. 2). Only 2% (1/48) reported use of opioids for more than 7 days.

The reason for discontinuing the use of opioids was reported by 39 respondents. These included the child no longer had pain requiring opioid medication (87.2%), ran out of the opioid medication (5.1%), or other (7.7%). The free text “Other” reasons included ‘never used it’, ‘never ended up needing it as his pain was controlled with ibuprofen’, and ‘only using the opioid if extreme pain’.

Of 49 parents or guardians who reported their storage practices and reported all options that applied, 81.3% (26/32) of respondents reported storing the opioid in an unlocked kitchen space, 53.3% (8/15) in an unlocked bathroom cabinet, 46.7% (7/15) in an unlocked space in the parent or guardian bedroom, 40% (2/5) in an unlocked space in the child's bedroom, 80% (4/5) in an unlocked personal bag/purse, and 60% (6/10) in an unlocked other cabinet (Fig. 3). When educational level was correlated with storage in an unlocked location, 11.5% of those with a high school degree, 9.6% with a trade school certification, 7.7% with an associate degree, 51.9% with a bachelor degree, and 19.2% with a postgraduate degree reported utilizing an unlocked space (Fig. 4).

Of 49 respondents, 83.7% (41/49) reported having leftover doses of opioid from the child's prescription, 14.3% (7/49) reported no leftover opioids, and one participant declined to answer. Of the 41 who reported having left over opioids or declined to answer, 83.3% (34/41) said they had not disposed of the medication. While the majority (61.8%) of respondents reported that they planned to discard the opioid medication,

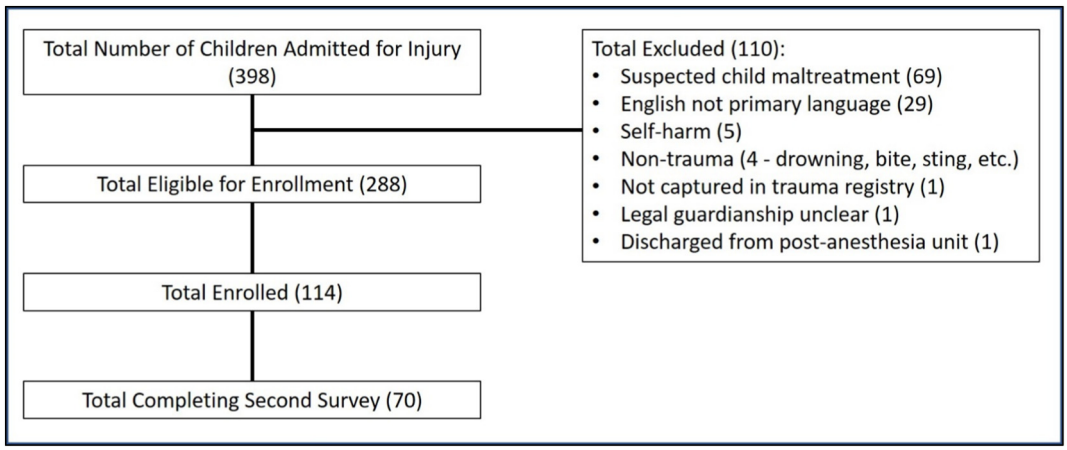

Fig. 1. Flow diagram of participant enrollment, inclusion, exclusion, and study completion.

a large minority of parents and guardians (38.2%, 13/34) reported they had no plans to dispose of their child's left-over opioid medications. Among those who reported no plan to dispose of their opioid medication, 7.7% reported having a high school degree, 7.7% a trade school certification, 15.4% an associate degree, 38.5% a bachelor's degree, and 30.8% a postgraduate degree (Fig. 4).

Table 1
Patient age and parent/guardian race, ethnicity, highest educational level, current employment status, and annual household income (N = 114).

Patient age (N = 114)	%
0–2 years old	11
3–5 years old	18
6–12 years old	36
13–17 years old	35
Parent/guardian race (N = 114)[a]	
African American	9.7
American Indian or Alaskan Native	0.9
Asian or Asian-American	2.7
Caucasian	77.9
Native Hawaiian or Pacific Islander	0
Prefer not to answer	4.4
Other	9.7
Parent/guardian ethnicity (N = 114)	
Hispanic	16.8
Non-Hispanic	65.5
Prefer not to answer	4.4
Other	13.3
Parent/guardian highest education level (N = 114)	
Primary schooling	1.7
High school diploma or equivalent	34.2
Trade school certification	8.8
Associate degree	10.5
Bachelor's degree	28.1
Postgraduate degree (e.g. Master's, MD, PhD)	13.2
Prefer not to answer	1.8
Other	1.8
Parent/guardian employment status (N = 114)	
Employed for wages	66.7
Self-employed	9.6
Out of work and looking for work	4.4
Out of work but not currently looking for work	1.8
Homemaker	10.5
Student	2.6
Retired	0
Unable to work	1.8
Prefer not to answer	0.9
Other	1.8
Annual household income (N = 114)	
<$25,000	17.5
$25,000–$50,000	23.7
$51,000–$75,000	14
$76,000–$100,000	12.3
>$100,000	19.3
Prefer not to answer	12.3
Other	0.9

[a] Respondents could select multiple items for race.

Forty-one parents or guardians reported their opioid disposal practices and reported all options that applied. Disposal method was reported as authorized public substance disposal location (36.6%), back to the original pharmacy (19.5%), down a sink (19.5%), in the garbage in an altered form (17.1%), down a toilet (9.8%), and in the garbage in its original form (4.9%). Of the 14.6% who responded with "other", one parent was 'unsure', two parents said they would 'keep it', two said 'back to the doctor'.

Forty-nine parents responded to questions regarding verbal or written opioid education provided at discharge. Of these, 89.8% reported verbal information on when to give opioid medication versus 95.5% reporting written information. Regarding frequency of opioid administration, 89.8% reported verbal instruction versus 93.9% reporting written information. Regarding quantity of opioid to give, 71.4% reported verbal versus 95.9% reporting written information. Regarding storing the medication safely, 37.5% reported verbal instruction versus 58.3% reporting written information. Regarding proper disposal of opioids, 23.4% reported verbal instruction versus 42.6% reporting written information.

Sixty-nine parents/guardians responded to questions about giving non-opioid medications to their child for pain. Of these, 57 (82.6%) reported using non-opioid pain medications for their child's pain. Of the 57 reporting non-opioid therapy, (83.6%) reported giving acetaminophen, (78.7%) reported ibuprofen, while the other options (aspirin, naproxen, ketorolac, herbal supplements) were all 0%.

Sixty-eight parents/guardians responded to questions about non-medical therapy to treat their child's pain. Of these, 30 parents (44.1%) reported using non-medication therapies including warm/cold compress (58.6%), positive reinforcement (48.3%), relaxation exercises (41.4%), massage/physical therapy (41.4%), arts (34.5%), or other (13.8%).

3. Discussion

The study results demonstrate that the majority of parents/guardians perceive resolution of their child's severe pain requiring opioids within 72 h of hospital discharge and that virtually all ceased requiring opioids by 7 days after discharge. Only 2% reported continuing their original opioid prescription beyond 7 days, and 5% reported the reason for stopping opioids was running out. These findings suggest that majority of patients had more doses of opioids prescribed than necessary to control their pain in this sample. A minority of patients had ongoing use of, or perceived need for, opioids beyond the prescribed amount (5%) or duration (2%). This suggests the need for further investigation to identify injury types and patient factors that have persistent pain

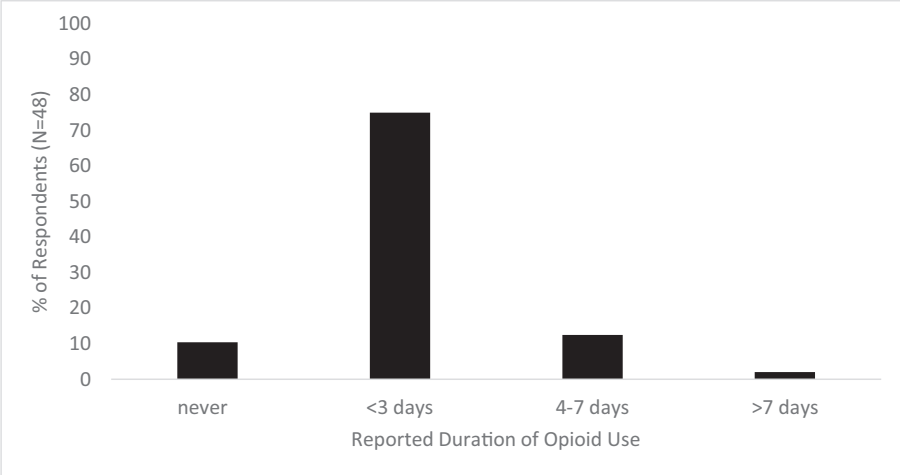

Fig. 2. Parent/guardian report of their child's duration of opioid after hospital discharge.

beyond 7 days. Future research on improving education on therapeutic goals, side effects, and response to side effects would be valuable and reduce the chance of a patient having beneficial therapy withheld.

A large proportion of respondents reported leftover opioids that had been prescribed to their children. Over one third of respondents plan to retain the unused opioids. This is particularly concerning as we found that the majority of respondents reporting storage in unlocked locations in the home, including 40% in the child's bedroom. The rates of unsecure storage and disposal practices are comparable with a recent survey study that showed only 18.9% of parents reported storing the prescription in a locked place, and only 21.4% disposed of excess leftover medication [4]. Unsecured opioids are a known source for misuse including unintentional ingestion by young children [5]. We found a pattern that those with a bachelor's degree or higher reported education levels appeared more often to utilize unlocked storage and planned to retain unused opioids than those with associate degrees or lower. However, statistical significance was not demonstrated, and further research is needed to investigate these observations.

When asked about disposal locations, 34.2% of respondents said they would put unused opioid medication down a toilet, sink, or garbage in its original form. While this recommendation continues to be suggested as an option by the DEA and FDA, patients in our catchment area have multiple options for returning unused opioids to pharmacies or to local law enforcement. As only half of respondents reported per-discharge education on proper disposal of opioids, there is clearly an opportunity for improvement in our local area.

We were surprised to see an increase in both prescribing rates (65% vs. 79.1%) and filling rates (64% vs. 92.5%) from our 2016 study to the present study. This may simply reflect different study design (systematic chart review and assessment of the state prescription monitoring program in the first study vs. parent/guardian recall of the current study). Alternately, this may reflect trends in local practice. For example, our hospital pharmacy introduced a service for filling home prescriptions prior to leaving. Also, many local pharmacies ceased to carry liquid opioids so medical staff would encourage filling prescriptions at the hospital prior to departure to ensure filling occurred.

The importance of identifying and addressing all sources of publicly available prescriptions opioids cannot be overstated. A report from the Substance Abuse and Mental Health Services Administration (SAMHSA) found that there were over 400,000 emergency department (ED) visits in 2011 related to opioid pain medication, including greater than 5000 accidental ingestions of opioids by children age 0–5 years [6]. Analysis of the National Electronic Injury Surveillance System (NEISS) data for 2004–2005 estimated that 71,000 emergency department visits per

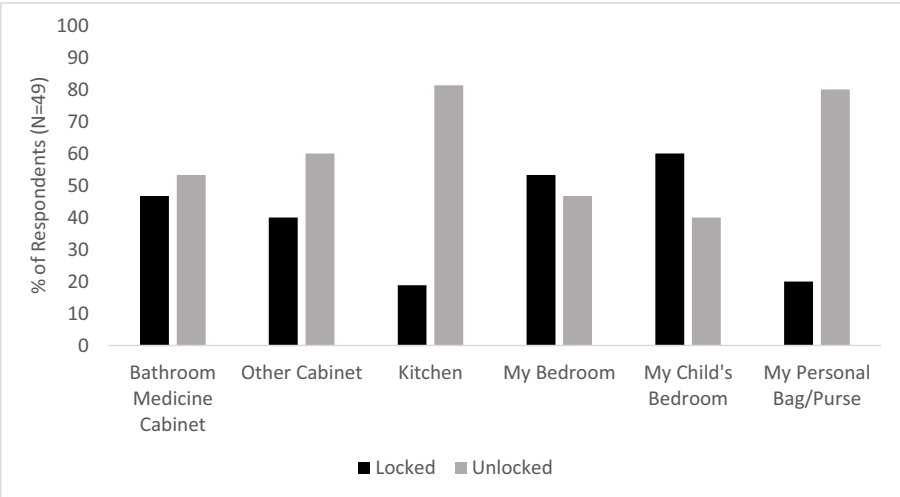

Fig. 3. Parent/guardian reported storage location for their child's opioid prescription.

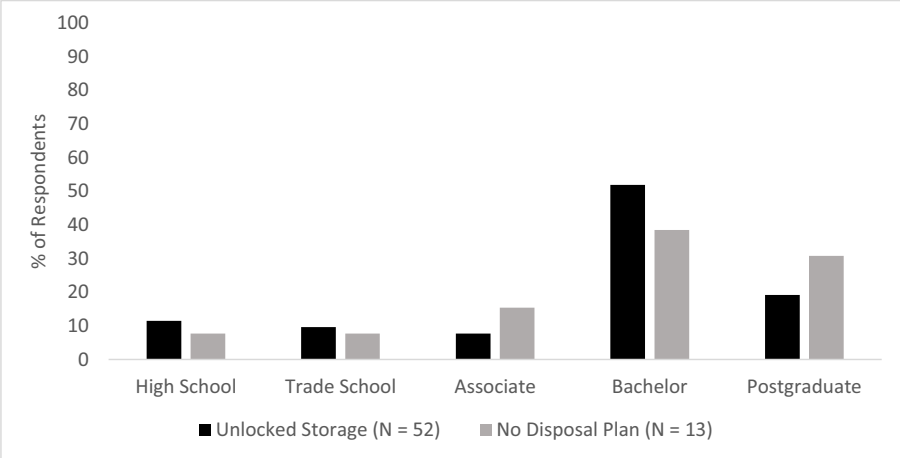

Fig. 4. Parent/guardian reported education level correlating to reported unlocked storage use and no disposal plan for prescription.

year for children less than 18 years old were related to unintentional medication overdose and 5075 of those annually were related to prescription opioids[6]. Data from the Youth Risk Behavior Surveys (YRBS) conducted by the Centers for Disease Control and Prevention (CDC) for 2017 show that 14% of high school students nationwide report taking a prescription medication without a provider's prescription [7]. In our state of Rhode Island, 13.5% of youths in grades 9–12 reported using prescription drugs without a doctor's prescription [4]; this state ranks among the highest areas for nonmedical prescription opioid use, along with one of the highest opioid overdose mortality rates across the nation [8]. Further, it is estimated that the cost in the United States for opioid abuse was $55.7 billion in 2007, with $25.6 billion related to lost productivity in the workplace, $25 billion related to health care costs, and $5.1 billion related to the criminal justice system [9]. All these data points show that the opioid epidemic is an expensive and significant problem.

Our findings suggest that opioids used to treat pain after pediatric injury contributes to the excess of unused opioids available for the general public for potential misuse. The design of this study does not allow quantification of the excess doses of opioids within our study population. Due to recent changes in our state that set rigid parameters on the duration of treatment for acute pain, we cannot extrapolate the excess dosages from our unpublished 2016 data as that study was conducted prior to the new prescribing regulations.

While discharge instructions and publicly available information on safe management, storage and disposal of opioids at home were reported to be frequently given to our respondents, the penetrance and efficacy of that information among parents/guardians is unknown. Our findings of frequent self-reported unsecure storage and plans for retention of unused doses is very concerning and warrants further investigation and, perhaps, consideration of public policy changes.

Our study has several inherent limitations. Participants were enrolled on a convenience basis so the subjects may not be representative of all parents/guardians of pediatric patients being discharged with opioid medications after injury. As we approached patients only on certain days (weekdays and not on weekends), certain patterns and severity of injury may be underrepresented. However, the 12-month study period allowed for capture of patients during the summer and vacation times when children tend to present more frequently with trauma. We were limited to enrolling parents whose primary language was English and thereby under-assessed certain segments of our local population. Our data may be affected by recall bias due to time from events to reporting or from parents or guardians sharing opioid management responsibilities with another individual or the patients themselves. There is also potential social desirability bias where their answers may have been influenced by the socially acceptable norms, including limited use and safe disposal of opioids. Respondents may have inherent biases against opioids use or have heard of news surrounding the current state of opioid abuse in our nation, so these biases may have impacted the way they responded to the survey questions.

The generalizability of this study is inherently limited as this study did not quantify opioids prescriptions (including type, dosage, number dispensed, and refills), correlate perceived pain to the type of injury (e.g., surgical or trauma injury admission), and assess parents' and guardians' perception of risk of retaining unused medication. Finally, this study was conducted at a Level 1 Pediatric Trauma Center (PTC), allowing for a higher volume of patients to approach; however, our findings may apply only to Level 1 PTCs and not potentially applicable to all injured pediatric patients treated at non-trauma centers.

Our study suggests that a minority of parents may be underutilizing opioids due to inaccurate parent/guardian concerns of addiction or negative side effects. For future research, opioid dosing and actual need after hospital discharge for each injury type could be assessed; this may lead to improved parent and guardian education on the topics of addiction potential, adverse drug events, secure storage, and proper disposal. It would be of interest to investigate other clinical sites such as community hospitals or rural areas. Subpopulations under the exclusion criteria as needing further study include the patient/parent dyads whose primary language was not English; parents of children who are incarcerated or wards of the state, or being evaluated for suspected child maltreatment; and patients with chronic conditions already requiring opioid medications for pain management.

4. Conclusions

Our findings support the hypothesis that injured children are often prescribed a greater quantity of opioids than they require. Provider recommendations to fill prescriptions may be overstated as filling rates exceeded patient pain medication requests. The rate of unsecure storage and plan to retain unused opioids are potential targets for discharge opioid education.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpedsurg.2020.10.016.

Author responsibilities

Anna Delamerced, BA – Study design, Survey design, Data collection, Data analysis, Manuscript preparation

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Debra Watson-Smith – Study design, Data collection

Kristina Monteiro, PhD – Survey Design, Data analysis, Manuscript preparation

Hale Wills, MD, MS – Study design, Survey approval, Data analysis, Manuscript preparation

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