

## Perioperative Opioid Management for Pediatric Populations

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### Abstract

Opioid administration for pain management in the perioperative setting of pediatric surgery is often essential. However, perioperative opioid prescription use may lead to opioid misuse and dependence. While crucial for preventing acute pain from evolving into chronic pain, opioid use must be carefully managed to avoid potential complications.

Perioperative prescription opioids can act as gateways to future misuse in adolescents. Studies show early legitimate opioid use is linked to a higher risk of later misuse, with many adolescents obtaining opioids from prior prescriptions. Pediatric opioid overdoses increasingly involve synthetic opioids, highlighting the need for stringent prescribing practices and leading to the development of guidelines aimed at reducing excessive and variable prescribing in pediatric patients post-surgery.

To address the issues to improve patient's safety related to opioid usage and pain control, a multimodal educational intervention for caregivers of pediatric surgery patients is being organized. This includes an educational video and pamphlet on opioid administration, storage, and disposal for caregivers of pediatric patients. Pre- and post-education surveys will measure the intervention's effectiveness, with follow-up surveys tracking opioid usage and disposal practices. The goal is to enhance caregiver knowledge, reduce misuse, and ensure the safe disposal of unused medications.

In conclusion, managing opioids in pediatric perioperative care requires a balanced approach to ensure effective pain relief while minimizing risks. Educating caregivers and implementing opioid take-back programs are crucial in mitigating the opioid crisis among pediatric populations.

### Keywords

Opioid, Perioperative, Pediatric, Waste, Management, Education

### Introduction

Opioid administration for pain management in pediatric patients undergoing surgery is a common practice. Adequate pain control is essential to prevent acute pain from evolving into chronic pain, which can lead to long-term physical and psychological complications [1,2]. However, the use of opioids must be carefully balanced to avoid the potential for misuse and dependence.

Postoperative prescription opioids pose significant

risks, including overdose. The number of deaths due to prescription opioid overdose has fluctuated, with 14,716 fatalities reported in 2022 [3]. A portion of these deaths involves pediatric cases. Between 1999 and 2016, 8,986 children died from prescription and illicit opioid poisoning [4]. During this time the mortality rate from prescription and illicit opioid poisoning had increased threefold. More recent data from 2019 to 2021, indicates that there were 112 pediatric deaths associated with prescription opioids within these years [5]. While this number may seem encouraging, much like adult trends, pediatric opioid overdoses have shifted from non-synthetic to semi-synthetic and fully synthetic opioids. Of the 2,231 pediatric overdose deaths from 2019-2021, 91.3% of these deaths involved an opioid and 83.9% involved illicitly manufactured fentanyl. This change represents a 109% increase in overdose deaths in children 10-19 within this short time frame, with opioids being a common factor. As overdose deaths increasingly involve synthetic opioids, healthcare providers may be too quick to distance themselves from the crisis. Although providers may not directly claim responsibility for overdose deaths due to partial or fully synthetic opioids, their involvement in the crisis remains significant.

While perioperative prescription opioids are not the primary contributors to the pediatric death toll from opioid overdoses, they are concerning as potential gateways to future opioid misuse and dependency [6]. Studies have shown that legitimate opioid use before high school graduation is independently associated with a 33% increase in the risk of future opioid misuse post-graduation [7]. Moreover, nonmedical prescription opioid use has been prospectively linked to subsequent initiation of heroin use in adolescents [8-12]. Of those adolescents who begin non-medical prescription opioid use, a majority cite healthcare professionals as their most common source of opioids [13]. These opioids, sourced from healthcare providers, may either come from the individual's own prescription (26%) or through diversion (39.2%) which is defined as the illegal distribution or abuse of prescription drugs for purposes not intended by the prescriber. This concern has been

echoed in several studies. In one study involving high school seniors, approximately 80% of nonmedical users with an earlier history of lawful medical use had obtained prescription opioids from a prior prescription [14]. The significant associations between adolescents receiving prescription opioids and beginning nonmedical use of opioids highlight the potential role of prescription opioids in this epidemic.

Ultimately, prevalence of prescription opioid use among adolescents and young adults in the US remains high and problematic [15,16]. In response to the opioid crisis, numerous organizations and surgical groups have urgently developed guidelines for prescribing perioperative opioids to adults [17,18]. However, until recently, evidence-based guidelines for opioid prescriptions in pediatric patients post-surgery were lacking. The lack of guidelines had led to a high degree of variability in opioid prescribing patterns among surgeons of pediatric patients [19-22]. Historically, pediatric patients have been prescribed more opiates than necessary [23,24]. Moreover, research suggests that perioperative opioid prescriptions may be unnecessary in surgeries associated with mild to moderate pain [25,26]. Given these findings and the potential consequences of inappropriate opioid prescriptions, newly introduced guidelines offer graded recommendations [27]. The impact of these guidelines on mitigating the role of prescription opioids in the opioid epidemic remains to be fully understood, given their recent and variable implementation.

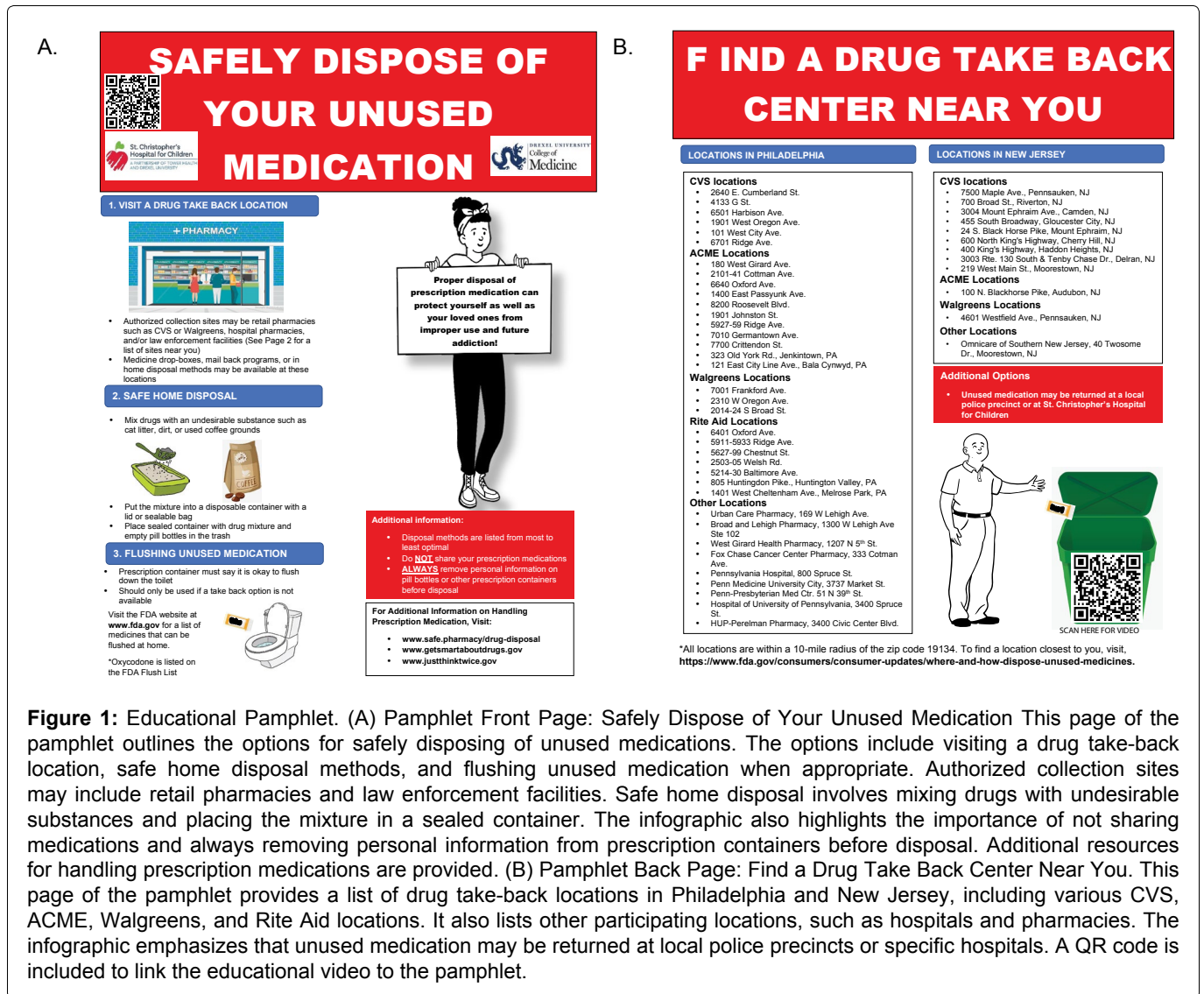
A key recommendation from these guidelines underscores the importance of healthcare providers involving patients and families in opioid stewardship initiatives during the perioperative care of children and adolescents. This approach aims to optimize pain management and minimize risks associated with opioid use. Specifically, guidelines advocate for educating both caregivers and children about expectations and methods of pain management before the surgery, with consistent pain management messaging coming from all members of the perioperative team. Furthermore, guidelines recommend that pain management education be tailored to the caregiver and child's needs and include adverse drug event education. Additionally, it is recommended that caregivers and older children store opioids in a secure location and properly dispose of unused medication. Optional disposal sites should be provided by health care entities. Echoing these guidelines, the American Academy of Pediatrics stresses the importance of careful monitoring and clear communication with caregivers about the risks and benefits of opioid use during postoperative care [28].

Education can play a crucial role in preventing misuse. While there are numerous topics requiring patient education, proper storage and disposal of opioids

stands out as particularly important. In a study involving caregivers of pediatric surgical patients, discussions with healthcare providers commonly covered how often to take the medication (84%), when to cut down on pain medication (64%), and side effects (61%). However, only 33% of caregivers reported receiving guidance on what to do with leftover pain medication [29]. Leftover opioids are frequently encountered, partly due to excessive prescribing practices [30]. Recent trends suggest that there has been a substantial decrease in postoperative opioid dispensing in pediatric populations, however experts continue to urge for using the lowest daily dose, tailored prescribing, and further interventions [31-34]. Despite these efforts in reducing prescriptions, concerns remain regarding the safe storage of excess opioids. Many studies have found that excess opioids are commonly stored in unsecured locations, potentially increasing the risk of misuse [35,36]. Thus, addressing these issues through targeted education is essential.

To address the gap and improve patient safety related to opioid usage and pain control, we are planning a multimodal educational intervention aimed at caregivers of pediatric surgery patients. Caregivers will volunteer to take part in this initiative via a flier with a QR code sign-up, distributed in surgical offices during patient surgical consultations. This novel initiative includes an educational video (<https://youtu.be/CByOp2T4nV8>) and an accompanying pamphlet designed to instruct caregivers on the appropriate administration, storage, and disposal of opioids [37,38]. The video and pamphlet will be made accessible to the caregivers of pediatric patients during their time in the waiting room as their child's surgery occurs. Pre-education and post-education surveys will assess the effectiveness of these materials in improving caregiver knowledge and comfort levels. A follow-up survey conducted two weeks post-discharge will gather data on actual opioid usage and disposal practices, providing insights into the intervention's long-term impact. If proven successful at the study endpoint, this multimodal educational intervention may be integrated into routine preoperative procedure. While the recruitment of volunteers and distribution of educational tools was designed for St. Christopher's Hospital for Children, the configuration of this intervention is generalizable to any hospital that prescribes postoperative opioids to pediatric patients.

Regarding the educational material, the video will inform caregivers of post-surgery expectations for pediatric patients. Many caregivers may not be aware that their child could experience postoperative pain. Caregivers may also not appreciate the severity of this pain. This uncertainty can be distressing and confusing for caregivers and patients. Providing clear information about the expected pain levels and effective pain



**Figure 1:** Educational Pamphlet. (A) Pamphlet Front Page: Safely Dispose of Your Unused Medication This page of the pamphlet outlines the options for safely disposing of unused medications. The options include visiting a drug take-back location, safe home disposal methods, and flushing unused medication when appropriate. Authorized collection sites may include retail pharmacies and law enforcement facilities. Safe home disposal involves mixing drugs with undesirable substances and placing the mixture in a sealed container. The infographic also highlights the importance of not sharing medications and always removing personal information from prescription containers before disposal. Additional resources for handling prescription medications are provided. (B) Pamphlet Back Page: Find a Drug Take Back Center Near You. This page of the pamphlet provides a list of drug take-back locations in Philadelphia and New Jersey, including various CVS, ACME, Walgreens, and Rite Aid locations. It also lists other participating locations, such as hospitals and pharmacies. The infographic emphasizes that unused medication may be returned at local police precincts or specific hospitals. A QR code is included to link the educational video to the pamphlet.

management techniques can alleviate these concerns. Additionally, the video addresses caregiver's fears surrounding opioid prescriptions, addiction and overdose while simultaneously highlighting the importance of opioids as a valuable tool for pain management when used appropriately. The video details the correct use of opioids for pain relief and emphasizes the importance of secure storage and proper disposal. Caregivers are advised to store opioids in a locked location and are informed of safe disposal methods such as returning them to a pharmacy, DEA-authorized site, a physician's office, or flushing them down the toilet.

The pamphlet functions as a visual aid for caregivers, designed to be taken home for reference. The pamphlet features a QR code that can be scanned to reach the educational video at any time. The front page of the pamphlet provides detailed information on the optimal methods for disposing of unused opioid prescriptions, ranked from most to least preferred (Figure 1A) [39]. On the back of the pamphlet, locations for drug take-back programs, within a 10-mile radius of the hospital of interest, are listed (Figure 1B). Drug take-back programs

provide a safe and convenient location, registered with the U.S. DEA, where controlled substances may be dropped off [40]. These locations may be permanent collection sites or periodic events that are hosted by the DEA on national Drug Take Back Days. Beyond this pamphlet, the DEA, National Association of Boards of Pharmacy, and several other reliable websites provide drug disposal locator tools [41].

In conclusion, opioid management in pediatric perioperative care requires careful balance to ensure effective pain relief while minimizing the risk of misuse and addiction. Educating caregivers about proper opioid use, storage, and disposal, coupled with the implementation of an opioid take-back program, may enhance the safety and efficacy of perioperative opioid management. By addressing these concerns, healthcare providers can play a crucial role in mitigating the impact of the opioid epidemic on pediatric populations and their families.

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## Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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