



## **Pediatric Postoperative Pain Management at Home Barriers in Assessment and Treatment**

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The optimal method for providing analgesia in children who have been discharged home after an outpatient or short-stay surgery has not been defined. The balance between adequate pain control and minimization of adverse effects is often difficult to achieve, particularly in younger children who are unable to localize and quantify their pain. There has been little guidance in the medical literature, and no consensus guidelines for this area currently exist. In the last several years, a number of papers have added to our understanding of this area and provide some potentially useful considerations.

### Pain Assessment and Management

A 2012 study by Stewart and colleagues at the Royal Children's Hospital in Melbourne evaluated the severity and duration of pain and analgesia requirements after common pediatric surgeries.<sup>1</sup> One hundred and five children undergoing tonsillectomy, orchidopexy, or inguinal hernia repair were enrolled. After discharge, parents were asked to document their child's pain using the Parents' Postoperative Pain Measure (PPPM), a validated 15-item observational checklist with a score of 6 or greater representing significant pain. A daily Functional Activity Score (FAS) was also recorded, as well as the amount of analgesics administered.

The tonsillectomy group had the highest PPPM scores, with over half of the children having a score greater than 6 throughout the first week after surgery. Day 12 was the first day that the median PPPM score was zero. The median PPPM scores after orchidopexy or inguinal hernia repair returned to zero by days 6 and 4, respectively. Patients in the orchidopexy group had the lowest scores overall, with a median score greater than 6 only on the first day after

surgery. Functional limitations were most evident on the first 2 days after surgery in all three groups. Time to a full return to normal activities also varied among the groups, with the majority of tonsillectomy patients not considered to be back to their baseline until 12 days. In contrast, most patients undergoing inguinal hernia repair had returned to normal activities within 7 days and most orchidopexy patients within 5 days after surgery.

Children who had undergone tonsillectomy typically received acetaminophen with codeine or acetaminophen alone. Most of these patients were no longer receiving analgesics after day 9. Over half of the tonsillectomy patients were taken to their pediatrician during their recovery. Additional prescription analgesics were prescribed in 17% of those visits. Acetaminophen was the most common agent after inguinal hernia repair, followed by ibuprofen alone. The majority of children in this group were no longer being given analgesia after day 3. The recommendation given to the families of the orchidopexy patients was a regimen using both ibuprofen and acetaminophen. Most patients in this group were no longer receiving analgesia by postoperative day 4.

This study was one of the first to follow patients from surgery to full recovery, with assessment of both pain and functional limitations. It serves as a useful tool for establishing the anticipated recovery time for three common pediatric surgeries and guidance for estimating the number of analgesic doses needed. The authors suggest that acetaminophen alone may be adequate for patients undergoing inguinal hernia repair, with most requiring treatment for only 1-2 days. They found a multimodal regimen of acetaminophen and ibuprofen to be effective in the orchidopexy patients, with patients needing treatment for 4-5

days. Children undergoing tonsillectomy, however, tended to have more significant pain for a longer period of time and may require an opioid in combination with OTC analgesics. They noted the frequent use of codeine in this study, particularly in the tonsillectomy patients, which is no longer recommended due to the potential for toxicity in patients with CYP2D6 polymorphisms. The authors acknowledge that this was the result of its availability as an OTC medication in Australia and a lack of dissemination of warnings against use in younger children at that time.

In 2014, Vons and colleagues at the University Medical Center, Utrecht evaluated pain assessments in an observational cohort study of 167 children less than 13 years of age undergoing adenoidectomy (AD) or adenotonsillectomy (ATE).<sup>2</sup> The AD patients received acetaminophen before and after surgery, while the ATE patients received both acetaminophen and diclofenac suppositories. The AD patients were treated on an as needed basis. The parents of the ATE patients received recommendations to administer acetaminophen three times daily with diclofenac twice daily for the first 5 postoperative days. Parents assessed their child's pain with the PPPM tool and a visual analogue scale (VAS).

Children in the ATE group had a higher mean pain score than that in the AD group, beginning at arrival in the recovery area and continuing for the duration of the study. The first scores evaluated by the parents upon arrival at home were the highest, with a mean PPPM of 1.5 and VAS of 2 for the AD patients and a PPPM of 9 and VAS of 4.5 for the ATE patients. By day 2, the median AD patients PPPM and VAS scores were zero while the ATE patients had median PPPM score of 6 and a VAS score of 3. Daytime activities normalized by day 2 in the AD group and day 7 in the ATE group. Twenty-five percent of the patients in the AT group received acetaminophen on postoperative day 1, but only 7% were still receiving analgesics on postoperative day 7. On day 1, 95% of the ATE group received acetaminophen and 97% were given diclofenac. This had decreased to 44% and 9%, respectively, by day 7. The average length of therapy was 4.5 days for acetaminophen and 3.8 days for diclofenac. The authors noted that their study was limited by the lack of a validated objective pain scale and the tendency of parents to stop documenting pain scores once their child began to improve. In spite of these limitations, the study remains a useful addition to the literature for its detailed assessment of pain in children undergoing these two procedures.

Similar findings were reported in a study from the Children's Hospital of Orange County (CHOC) published in the February 2016 issue of *Anesthesia and Analgesia*.<sup>3</sup> Brown and colleagues studied pain scores and analgesic use in 105 Hispanic children after ATE.<sup>3</sup> Families were asked to assess their child's pain each day using the Faces Pain Scale-Revised (FPS-R) and instructed to give acetaminophen on a scheduled based and codeine or hydrocodone every 3 to 4 hours as needed. Seventy percent of children were reported by the families to have scores indicating significant pain on the first day at home; however, 32% received fewer than two doses of an analgesic. Nearly a quarter of the children (21%) received fewer than five doses over the first week after treatment.

#### Factors Affecting Analgesic Use

In 2009, Fortier and colleagues at CHOC evaluated pain scores and their relation to analgesic administration in 261 children 2 to 12 years of age following ATE.<sup>4</sup> All patients were hospitalized for 24 hours after surgery, and families were sent home with instructions to give 10 mg/kg acetaminophen with 1 mg/kg codeine every 4 to 6 hours for scores  $\geq 3$  on the Bieri Faces pain scale. The median PPPM score peaked on day 2 after surgery. Although 86% of parents rated their children's pain as significant, only 76% of children received more than one dose of an analgesic. The median number of total analgesic doses administered over the 2-week observation period was 6 (range 0-14). The majority (71%) received fewer than half of the available analgesic doses prescribed. No correlation was found between PPPM scores and the number of doses given. Bieri scores and their correlation to medication administration were not reported. The authors also reported no associations between the frequency of analgesic administration and demographic variables, preoperative patient distress, parent education, anxiety about the surgery, parent coping skills, or the child's temperament.

In a subsequent study of 132 children undergoing outpatient surgery, several of these investigators assessed parental attitudes about pain assessment and analgesic use prior to surgery and then compared those results with the child's postoperative pain management.<sup>5</sup> In addition to PPPM scores, knowledge and attitudes about pain management in children were scored with the Parental Pain Expression Perceptions (PPEP) tool and the Medication Attitude Questionnaire (MAQ). Higher PPEP scores represent misinformation or attitudinal barriers to treatment. A pain scoring tool (faces or numeric scales) was also provided by the hospital for parents to use in evaluating their child.

The median number of analgesic doses given at home per patient on postoperative day 1 was one (range 0-3), with 26% of patients not receiving analgesia. Thirty percent of parents reported their child asked for pain medicine; however, only 7% of parents used the pain scoring tool provided by the hospital to evaluate their child's pain. Ninety-five percent of the parents reported receiving specific instructions regarding analgesic use at home and 69% used the prescribed analgesic. Fifty-five percent administered the prescribed dose, but only 35% followed the prescribed instructions for how frequently to administer it. The most frequently cited reasons for variance were the use of over the counter (OTC) analgesics instead of the acetaminophen/codeine preparation (20%) and the use of smaller than prescribed doses (12%). Nearly half of parents (44%) stated that the child refused doses because of the bad taste. There was no correlation between PPEP and PPPM scores, suggesting that attitudinal and knowledge barriers were not a significant predictor of parents' report of their child's pain. However, decreased PPPM scores and higher MAQ scores predicted the administration of fewer analgesic doses ( $p < 0.01$ ), suggesting that parents' uncertainties and misconceptions about analgesics are likely to affect their willingness to give their children medication after surgery.

The authors found a similar relationship between medication beliefs and analgesic use in the postoperative management of 161 Hispanic children undergoing outpatient surgery.<sup>6</sup> A majority of parents expressed misunderstanding and misconceptions about both assessing pain in children and the use of analgesics. Following surgery, 61% of families rated their child's pain with the PPPM tool as severe, but only 57% of those children received the recommended number of analgesic doses. As in their previous paper, PPEP and MAQ scores suggested that expression of concerns related to analgesic use predicted the use of fewer doses of analgesics on the first postoperative day ( $p = 0.028$ ).

#### Improving Postoperative Analgesic Use

These studies suggest that children are frequently assessed by their parents to be in significant pain after outpatient or short-stay surgery, yet they receive relatively little analgesia. Two recent papers have described structured programs to improve access to analgesics and ensure appropriate administration instructions as a means of removing barriers to effective care. In 2013, Hegarty and colleagues evaluated the benefit of providing analgesics at discharge for pediatric outpatient surgeries.<sup>7</sup> The authors randomized 200 children into two groups: one group received both written and verbal

instructions on medication instructions and a packet of medications (ibuprofen every 8 hours for 48 hours and acetaminophen/codeine as needed) at discharge. The other group received the medication instructions alone. Pain ratings were similar between groups; 59% of the children in the group given the medication packet were rated as having no or mild pain, compared to 62% in the group given instructions alone. Rates for moderate to severe pain were also similar (41% versus 38%, respectively). Postoperative medication instructions were followed by 89% of families who received instructions and medications and in 86% of families given instructions alone ( $p = 0.68$ ), suggesting that providing analgesics at discharge may not be the key to improving analgesic use. Although medication instructions appeared to have been useful, only 48% of parents could recall the information they were given at discharge on the following day, indicating a need for more effective educational tools and better training for those giving the instructions.

A similar program was implemented by Walther-Larsen and coworkers at Copenhagen University Hospital.<sup>8</sup> Their structured intervention consisted of a multimodal analgesia plan using weight-based doses of ibuprofen and acetaminophen. The same acetaminophen dose was used around the clock for 24 hours, but the ibuprofen dose and frequency (around the clock versus as needed) varied by the type of surgery. Medication information was provided to the parents, as well as a supply of the drugs in a formulation chosen by the parent and child. All parents were instructed to give the medication on a fixed schedule for the first 24 hours. In a prospective observational cohort study, the authors assessed the effect of their intervention on pain scores in 149 children following outpatient surgery. Parental assessment of pain was performed with the PPPM short form and a numeric rating scale (NRS). The median PPPM score on postoperative day 0 was 4, with a median score of 1 on day 1. Median NRS scores were 2 on day 0 and 1 on day 1. The authors found a significant correlation between the two assessment tools ( $p < 0.0001$ ). A total of 97% of the children received acetaminophen as recommended. Seventy-two percent of patients received ibuprofen around-the-clock on the first postoperative day and 19% were given ibuprofen as needed. The authors concluded that their structured discharge plan resulted in pain that was well managed at home.

#### Appropriate Prescribing of Opioids

In 2015, Abou-Karam and colleagues at Sainte-Justine University Health Center evaluated prescriptions for analgesia given to the families of 243 children (median age 4 years) following

outpatient surgery at their institution.<sup>9</sup> The surgeries were most often otolaryngology procedures (55%), urologic or gynecologic procedures (14%), or orthopedic procedures (12%). All patients were given a prescription for morphine (median dose 0.19 mg/kg, range 0.03-0.41 mg/kg). The primary outcome of the study was administration of morphine as directed. Prescriptions were divided into those with instructions for regularly scheduled doses (47%) and those for a dose to be given as needed (53%). A total of 186 families (85%) had the prescriptions filled at a pharmacy. Of those families who chose not to fill the prescription, 70% gave as their reason that the child had no pain or mild pain that was relieved with acetaminophen. Only six families stated that they were unwilling to give their child morphine.

Of the 104 families given the prescription for regularly scheduled morphine, only 56% gave it as prescribed. The most frequent reason for variance was that their child had no pain or responded adequately with doses given on an as needed basis. Five families related negative perceptions about morphine and another six were concerned for adverse effects. These parents and guardians were able to correctly describe opioid adverse effects. Other common reasons for variance were the child's refusal to take the medicine in seven cases and not wanting to wake the child at night in four cases. In the families given the as needed prescriptions, 85% adhered to the regimen. In the families who had the prescription filled, the majority of the children (63%) received two or fewer doses of morphine. For the patients in both groups who received morphine, the most common adverse effects were drowsiness (18%), vomiting (17%), constipation (15%), and nausea (9%).

In a subset of 77 patients for whom complete prescription information was available, the median number of prescribed doses was 18 (IQR 10-20) while the median number actually given was one (IQR 0-3). Fifty-five percent of families returned the remaining morphine to the pharmacy, while 27% disposed of it at home. Only 9% of parents stated that they kept the remaining morphine at home for later use, a much lower percentage than reported in previous studies.

While this study confirms that children undergoing outpatient surgery typically have pain for several days, many required only OTC analgesics after the first couple of days following surgery. In light of the results of the study, and the knowledge that many families keep the remaining medicine in the home, the authors suggest the need for thoughtful consideration of the total number of opioid doses prescribed for

pediatric outpatient surgeries. Reducing the available number of opioid doses to that expected to be needed, with additional instructions for the use of OTC analgesics and the availability to contact a healthcare provider if pain continues, may lessen opioid exposure in children and reduce the risks for adverse effects, accidental ingestion, or abuse by others.

### Summary

Recent studies have given healthcare providers a more complete picture of both the severity and duration of pain following common pediatric outpatient surgeries. Several needs have been identified in these studies, including methods to increase parents' understanding of pain in their children and to assist healthcare providers in acknowledging and helping to mitigate concerns over analgesic use. Improvements in medication education are also needed to allow clinicians to provide information in a format suited for the family that can be easily retrieved at any point throughout the patient's postoperative course.

### **References**

1. Stewart DW, Ragg PG, Sheppard S, et al. The severity and duration of postoperative pain and analgesia requirements in children after tonsillectomy, orchidopexy, or inguinal hernia repair. *Pediatr Anesth* 2012;22:136-43.
2. Vons KMJ, Bijker JB, Verwijns EW, et al. Postoperative pain during the first week after adenoidectomy and guillotine adenotonsillectomy in children. *Pediatr Anesth* 2014;24:476-82.
3. Brown R, Fortier MA, Zolghadr S, et al. Postoperative pain management in children of Hispanic origin: a descriptive cohort study. *Anesth Analg* 2016;122:497-502.
4. Fortier MA, MacLaren JE, Martin SR, et al. Pediatric pain after ambulatory surgery: where's the medication? *Pediatrics* 2009;124:e588-95.
5. Zisk Rony RY, Fortier MA, Chorney JM, et al. Parental postoperative pain management: attitudes, assessment, and management. *Pediatrics* 2010;125:e1372-8.
6. Rosales A, Fortier MA, Campos B, et al. Postoperative pain management in Latino families: parent beliefs about analgesics predict analgesic doses provided to children. *Pediatr Anesth* 2016;26:307-14.
7. Hegarty M, Calder A, Davies K, et al. Does take-home analgesia improve postoperative pain after elective day case surgery? A comparison of hospital vs parent-supplied analgesia. *Pediatr Anesth* 2013;23:385-9.
8. Walther-Larsen S, Aagaard GB, Friis SM, et al. Structured intervention for management of pain following day surgery in children. *Pediatr Anesth* 2015;26:151-7.
9. Abou-Karam M, Dube S, Kvann HS, et al. Parental report of morphine use at home after pediatric surgery. *J Pediatr* 2015;167:599-604.

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