Published in final edited form as:

J Spec Pediatr Nurs. 2012 April ; 17(2): 108–120. doi:10.1111/j.1744-6155.2012.00326.x.

Parents' Management of Children's Pain at Home after Surgery

Catherine Vincent, RN, PhD¹[associate professor], Maria Chiappetta, RN, BSN, CDE²[diabetes educator], Abigail Beach, RN, MSN, CPN²[staff nurse on an inpatient unit], Carolyn Kiolbasa, RN, BSN²[staff nurse in outpatient surgery], Kelsey Latta, RN, BSN, CPN²[staff nurse on an inpatient unit], Rebekah Maloney, RN, MSN, PCNS-BC, CPON²[advanced practice nurse with Stem Cell Transplant], and Linda Sue Van Roeyen, RN, MS, CCRP, CFNP-BC²[advanced practice nurse with the Pulmonary Habilitation/Transitional Care Unit]

¹University of Illinois at Chicago College of Nursing, Chicago, IL 60612

²Children's Memorial Hospital, Chicago IL 60614

Abstract

Purpose—We tested Home Pain Management for Children (HPMC) for effects on pain intensity, analgesics administered, satisfaction, and use of healthcare services over 3 post-discharge days.

Design and Methods—In this quasi-experimental study with 108 children and their parents, we used the numeric rating scale (NRS) or the Faces Pain Scale-Revised (FPS-R), calculated percentages of analgesics administered, and asked questions about expectations, satisfaction, and services. Between-group differences were tested with t-tests and ANOVA.

Results—After HPMC, children reported moderate pain and parents administered more analgesics on 2 study days. Parents and children were satisfied; parents used few services. Written instructions and a brief interactive session were not sufficient to change parents' analgesic administration practices to relieve their children's pain.

Practice Implications—Further research is needed to develop and test effective education interventions to facilitate relief of children's post-operative pain.

Search Terms

Children's pain; pain management; parents; postoperative pain

Due to shortened hospital stays, children's pain is often managed at home by parents, yet few controlled studies have been conducted to examine the effectiveness of parents' ability to relieve their children's pain. In studies of children after outpatient (day, short stay) surgery, up to 77% of parents reported that their children experienced moderate to severe levels of pain at home (Fortier, MacLaren, Martin, Perret-Karimi, & Kain, 2009). Unrelieved pain in children can result in increased pain sensitivity later in life (Mitchell & Boss, 2002; Taddio, Katz, Ilersich, & Koren, 1997; Weisman, Bernstein, & Schechter, 1998). While analgesics are known to be effective in relieving pain, numerous investigators have identified that parents administer fewer analgesics than ordered and recommended (Fortier et al., 2009; Huth & Broome, 2007; Rony, Fortier, Chorney, Perret, & Kain, 2010; Sutters & Miaskowski, 1997; Wiggins & Foster, 2007; Wilson & Helgadóttir, 2006). Parents are known to have misconceptions about pain assessment and pain management, particularly

Author contact: vincente@uic.edu, with a copy to the Editor: roxie.foster@UCDenver.edu.

Conflict of Interest Statement: The authors report no actual or potential conflicts of interests.

about analgesics (Helgadóttir & Wilson, 2004; Kankkunen, Vehviläinen-Julkunen, Pietilä, Kokki, & Halonen, 2003; Kankkunen, Vehviläinen-Julkunen, Pietilä, & Halonen, 2003; Rony et al., 2010; Simons & Roberson, 2002), which could influence how children's pain is managed at home after discharge from the hospital. Educational interventions aimed at correcting parents' misconceptions about pain management have been effective in improving parents' analgesic administration (Chambers, Reid, McGrath, Finley, & Ellerton, 1997; Sutters et al., 2004; 2010) and decreasing children's pain (Sutters et al., 2010).

Background

The majority of researchers examining parents' management of children's pain have done so in descriptive studies of children after outpatient surgery, usually after tonsillectomy. Based on behavioral observation at home after surgery, 31% to 77% of parents ($N = 897$ combined total of subjects across samples with sample sizing ranging from 50-315) reported that their children experienced moderate to severe levels of pain (Fortier et al., 2009; Helgadóttir & Wilson, 2004; Jonas, 2003; Kankkunen, Vehviläinen-Julkunen, Pietilä, & Halonen, 2003; Rony et al., 2010; Zisk, Grey, Medoff-Cooper, MacLaren, & Kain, 2008). Furthermore, when children self-reported pain ($N = 258$ combined total of subjects across samples with sample sizing ranging from 34 to 80), they also reported moderate (Huth & Broome, 2007; Sutters et al., 2004; Wilson & Helgadóttir, 2006) to severe (Wiggins & Foster, 2007) mean pain scores.

Parents' analgesic administration in the above studies did not always correlate with their children's pain intensities. For example, in one study, while 50% of children ($N = 68$) reported severe mean pain levels ($M = 3.0$ to 3.2 on a scale of 0 to 4), parents administered an average of 50% of prescribed analgesics over 3 study days (Wiggins & Foster, 2007). Similarly, Fortier et al. (2009) reported that 71% of the 261 children in their study received fewer than one-half of the available doses over Days 2 and 3 after tonsillectomy. When recommended/therapeutic dosing was measured, investigators reported that all children weighing more than 50 kilograms (kg) ($n = 13$) received less than recommended opioid doses (hydrocodone, codeine) and 96% of children less than 50 kg ($n = 25$) received less than recommended hydrocodone doses (Huth & Broome, 2007). Likewise, Wilson and Helgadóttir (2006) reported that 90% of the 68 children in their study received non-therapeutic doses of acetaminophen. And, in one recent study, 114 parents administered a median of only 1 dose of acetaminophen with codeine during the first postoperative day; 26% of these parents provided no analgesics (Rony et al., 2010).

Parents in the cited studies demonstrated knowledge gaps and misconceptions about pain assessment and management that could influence how they assessed and treated their children's pain. In studies with 100 and 110 parents respectively, Rony et al. (2010) and Zisk, Grey, MacLaren, and Kain (2007) reported that 36% and 44% believed children always express pain by crying or whining; 30% and 39% agreed that children always tell parents when they are in pain. In a study of 314 parents' perceptions of their children's pain, 20% indicated that pain was acceptable because of health benefits, 14% said their child did not remember pain, and 12% responded that their child had no pain if able to sleep (Kankkunen, Vehviläinen-Julkunen, Pietilä, & Halonen, 2003). Parents (43% to 52%) reported concerns about their child becoming addicted, 70 to 73% reported being fearful of adverse effects and overdose, and 30% to 42% reported that analgesics should be used as little as possible because of adverse effects (Rony et al., 2010; Zisk et al., 2007). Helgadóttir and Wilson (2004) reported that 83% of parents thought analgesics should be used as a last resort and 59% would not give analgesics before pain occurred even when expected; 75% of parents believed that their children received sufficient relief from the analgesics administered while 71% of the children reported moderate to severe pain.

Research teams conducting experimental studies aimed at improving parents' knowledge and/or attitudes about pain management at home have reported mixed results. All children studied were experiencing pain from outpatient surgery. Parents were provided with instructions about around-the-clock (ATC) versus pro re nata (PRN) analgesic dosing (Romsing, Hertel, Harder, & Rasmussen, 1998; Sutters et al., 2004; Sutters et al., 2010), using a pain assessment scale (Unsworth, Franck, & Choonara, 2007), and overall management (pain types/sources, assessment, pharmacological/nonpharmacological treatment) (Chambers et al., 1997). Findings showed that parents in the experimental groups in 4 of the 5 studies ($N = 315$; study samples = 40 -113) administered significantly more analgesics on at least one study day (Chambers et al., 1997; Romsing et al., 1998; Sutters et al., 2004; 2010) while others ($N = 72$) did not administer more analgesics after the intervention (Unsworth et al., 2007). Children's pain levels after interventions were decreased (Sutters et al., 2010), unchanged (Chambers et al., 1997; Romsing et al., 1998; Sutters et al., 2004), or not reported (Unsworth et al., 2007). These mixed findings are likely due to the different types of analgesics and frequency of administration. Sutters et al. (2004) and Romsing et al. (1998) instructed parents to administer analgesics ATC, which likely resulted in parents' increased analgesic administration whereas parents in Chamber's et al. (1997) study administered analgesics PRN. Sutters et al. (2004) concluded that children's pain was not relieved because acetaminophen with codeine was of insufficient strength for tonsillectomy pain. Children in the study by Romsing et al. only received plain acetaminophen, also likely insufficient. In contrast, in 2010, Sutters et al. again instructed parents to administer analgesics ATC but, in this study, acetaminophen with hydrocodone was prescribed, resulting in a decrease in children's pain.

Satisfaction is considered an important outcome measure of pain management (Leddy & Wolosin, 2005). Seid and Varni (1999) tested a management protocol about pain assessment with a valid tool and algorithm for pain scores and analgesics and found that parents ($n = 33$) who received the protocol were significantly more satisfied with their children's pain management than parents ($n = 36$) in the control group. Likewise, Huth, Broome, Mussato, and Morgan (2003) tested a pain management intervention including discussion of pain assessment and pharmacological and nonpharmacological treatment of pain and reported that the 27 parents who received the intervention were more satisfied with their children's pain management in the hospital than the 24 parents in the control group; these group differences were not significant.

Additional healthcare services can be needed when children's pain is not relieved or when parents are concerned about adverse effects of analgesics. Seid and Varni (1999) measured use of healthcare services for children after day surgery following discharge from the hospital. Children in the experimental group in this study required less, although not significantly less, service utilization (physician call or visit) than children in the control group. Warnock and Lander (1998) surveyed parents about postoperative complications and found that 38% of 129 parents had to make unscheduled medical visits or phone calls related to postoperative pain. Likewise, Homer, Swallow, and Semple (2001) reported that 27% of the 56 parents in their study contacted the physician for pain-related issues after their children's tonsillectomies.

In summary, research has shown that parents' management of their children's pain at home after surgery is often inadequate. Parents have knowledge gaps and misconceptions about pain assessment and management, particularly about analgesics. Intervention studies showed, albeit based on limited findings, that a structured educational program can improve children's pain relief and parents' administration of analgesics, can improve parent satisfaction, and may decrease the use of unplanned healthcare services after discharge from the hospital. Building on what is known about parents' management of their children's pain

after *outpatient* surgery, we examined the effectiveness of an educational intervention after *inpatient* surgeries (i.e., requiring hospitalization for at least 23 hours).

Purpose

The purpose of the study was to compare the effectiveness of Home Pain Management for Children (HPMC) with usual discharge teaching on children's pain intensity, parents' analgesic administration, parents' and children's satisfaction with pain levels, and use of unplanned healthcare services. The specific aims of this study are:

Aim I: To compare daily, over the first 3 post-discharge days, the effects of the HPMC intervention and the usual discharge teaching (control) on child outcomes (pain intensity and satisfaction with pain level), parent outcomes (amounts of analgesics administered and satisfaction with children's pain level), and a system outcome (use of unplanned healthcare services [phone call, additional prescription, physician and hospital visits] for pain-related symptoms).

We hypothesized that children in the intervention group would report lower pain intensity levels, report greater satisfaction with pain levels, and use fewer unplanned healthcare services than children in the control group. We further hypothesized that parents in the intervention group would administer more analgesics to their children and report greater satisfaction with their children's pain level than parents in the control group.

Aim II: To explore parents' and children's expectations about pain management at home after surgery.

Through use of an interactive educational intervention, we aimed to increase children's pain relief at home after surgery by improving parents' and children's knowledge about pain management and dispelling misconceptions, particularly about analgesics. An interactive intervention was employed because passive dissemination of information is known to be generally ineffective (Bero et al., 1998). To better manage children's pain at home, parents (and children when appropriate) must understand how to assess and treat pain, and to understand negative effects of unrelieved pain; program content addressed these topics. We also examined parents' and children's expectations about pain management to gain insight in this regard.

Methods

Design

We used a prospective, two-group, pretest-posttest, quasi-experimental design to address the study aims. All children in the control group were recruited first, followed by all children in the intervention group. Institutional Review Boards approved the study.

Setting and Sample

A convenience sample of parents and children were recruited from a 270-bed children's hospital in the Midwest that serves more than 100,000 children annually. Data were collected on the patient care units where children were hospitalized after surgery. Data were also collected in a post-discharge phone call and through logs kept by the parents at home.

Eligibility criteria for the children included: 7 to 17 years of age, expected to be hospitalized for at least a 23-hour observation period after selected surgical procedures (e.g., appendectomy, pectus repair, osteotomy, spinal fusion), discharged with a prescription for an analgesic opioid, able to understand and speak English, able to use either the 0 to 10

numeric rating scale or Faces Pain Scale-Revised, and a custodial parent was able to understand and speak English. Children were excluded if a cognitive impairment prevented them from using a pain scale. Both parents were welcome to participate in the study.

A sample size of 90 (45 in each group) achieves 83% power to detect a medium effect (.15) of the independent variables (HPMC, usual care) on the 5 dependent variables (pain intensity level, analgesics administered, satisfaction [child and parent], use of services) using an F-test for ANOVA with alpha of .05 (Winer, 1991). All other statistical tests required the same or a smaller number of subjects maintaining the effect size, alpha and power levels (i.e., a t-test with a sample of 90 would have .82 power for detecting a medium effect (.3) at alpha .05) Thus, the sample of 90 was expected to prove sufficient for all analyses.

Instruments

Pain Intensity—We measured children's self-reported pain intensity levels with a 0 to 10 numeric rating scale (NRS) or the Faces Pain Scale-Revised (FPS-R), the same instruments used to measure children's pain at the hospital. The NRS consists of asking the child to rate his or her perceived level of pain intensity on a numerical scale from 0 to 10, with 0 = no pain and 10 = the worst pain. The FPS-R, developed by Bieri and colleagues (Bieri, Reeve, Champion, Addicoat, & Ziegler, 1990; Hicks, von Baeyer, Spafford, van Korlaar, & Goodenough, 2001), includes six faces representing progressive levels of pain, ranging from 0 = no pain to 10 = very much pain. The number stated by the child (NRS or FPS-R) indicates his/her level of pain intensity. Reliability estimation of a pain intensity scale is hard to establish with the usual methods because pain scales are single-item measures of a fluctuating variable. Content and convergent validity for both the NRS and FPS-R have been demonstrated (Hicks et al., 2001; Jensen, Karoly, & Braver, 1986; Tesler et al., 1991; von Baeyer et al., 2009). We asked parents to record in the Pain Log their child's pain levels (date, time, scale used, and intensity) for 3 post-discharge days. Children used either the NRS or the FPS-R at home depending on their ability to use the scale and preference.

Analgesics administered—The amount of analgesics administered by parents was based on the type, dose, and frequency of PRN medication ordered by the physician at the time of discharge from the hospital. The amount of administered medication was determined by calculating the percentage of medication ordered by the physician that was given by the parent during the study period. We asked parents to record in the Pain Log any analgesics administered to their child (date, time, name and amount of medicine) for 3 post-discharge days. To obtain the physician's order for analgesics, we asked parents to verbally report all information on the label of the pain medicine container.

Satisfaction with children's pain level—We measured children's and parents' satisfaction with pain relief by asking children/parents, "Were you satisfied with your/your child's pain level at home?" (for younger children, "Were you okay with how much pain you had at home?"). The response options included: yes, no, or not sure. We asked parents and children about their satisfaction during our phone call on the third study day. This measure of parent's and children's satisfaction with pain level has not been psychometrically tested and was selected based on face validity and use in prior research (Huang et al., 2003; Huth et al., 2003; Jha et al., 2010; Seid & Varni, 1999; Wilkie et al., 2010) supporting construct validity.

Use of unplanned healthcare services—We defined healthcare services as any services for pain management including: call or visit to healthcare provider, emergency

hospital visit, and/or additional prescription for analgesics. We asked parents to report on services used during our phone call on the third study day.

Parent and child expectations—We evaluated expectations about pain management by asking parents/children to answer open-ended questions: “Have you thought about your child’s/your pain at home after surgery?” and “What have you thought about?” We asked these questions at the hospital prior to discussing details of the study.

Procedure

For both HPMC and usual care, we identified potential participants from the Surgical Schedule. Two weeks before the child’s surgery, the Primary Investigator (PI) sent a letter to parents explaining the study and inviting them and their child to participate. One week later, we called parents to answer any questions about the study and to request participation. Alternatively, our initial contact with the family was face-to-face at the hospital.

Data were collected by the investigative team, which included trained staff nurses on selected patient-care units. After surgery, we met with all parents and children in the children’s hospital rooms and obtained consent from parents and assent from children. Particular attention was paid to child assent; children were assured that even if their parents agreed to participate, if they did not wish to participate, their wishes would be honored. Using a script to standardize our approach, we collected data on parents’ and children’s expectations about pain management and about demographics, verified that parents and children knew how to use the self-report scale (0 to 10 NRS or FPS-R), explained use of the Pain Log, scheduled follow-up phone calls, and answered questions that parents and children asked. We provided parents with the primary investigators’ phone numbers and email addresses in case questions arose at a later time.

We called all families at home on the first 3 post-discharge days. During the phone calls, we asked parents to tell us about their children’s pain intensity levels and analgesics given over the past 24 hours. Investigators recorded this information on a duplicate pain log. We reminded parents to use the Pain Log to record these two items. On the third day after discharge, we also asked parents and children about their satisfaction with pain levels and asked parents about the use of any unplanned healthcare services. Finally, we asked parents to send the Pain Log to us in the self-addressed stamped envelope provided.

Usual discharge teaching about children’s postoperative pain was person-specific and dependent on whatever the particular healthcare provider told parents and children. There was no protocol or guidelines to standardize pain management discharge teaching on the patient-care unit during the study period.

Intervention

Parents and children in the intervention group participated in the HPMC educational intervention. We provided parents and children with the Pain Management Information sheet (available to take home), asked them to read it, and scheduled a follow-up session for later that day or the next day to discuss the pain management principles presented in the information sheet. Pain management principles included: consequences of unrelieved pain, pain assessment (self-report and behavior), pharmacologic and nonpharmacologic treatment of pain, and concerns about analgesics (e.g., side effects, addiction). At the follow-up session, we reinforced select information in the information sheet (e.g., give medication regularly) and assessed parents’ understanding of analgesics’ adverse effects and of addiction. We derived the evidence for the content of the information sheet from research literature and from the American Pain Society Principles of Analgesic Use (American Pain

Society, 2008). The information was written at the sixth grade level in order to be appropriate for parents and children 11 years and older.

Data Analysis

We computed descriptive statistics (frequencies, means, standard deviations) for all variables to summarize the data and to describe the sample. Simple differences between the intervention and control groups were tested using appropriate bivariate tests (independent t-tests, contingency table analyses). One-way ANOVAs were used to test group differences on each of the three days of data collection for pain intensities and amounts of analgesics administered. For qualitative data, thematic and descriptive analyses were used to summarize the open-ended questions about parents' and children's expectations about pain management.

Results

Sample Characteristics

Recruitment activity is diagramed in Figure 1. Of the 284 families we were able to contact, 88 (33%) were ineligible (e.g., non-English speaking, child unable to use FPS-R, other [discharged without prescription for analgesic, not discharged to parents]) and 46 (16%) declined (e.g., lack of time, lack of interest). From an initial sample of 150 recruited children, 108 parents (72%) completed at least 1 full day of pain logs and were included in the analysis—55 in the control group and 53 in intervention group. The 42 children lost to follow-up were lost due to inability to contact them at home or incorrect/incomplete completion of Pain Logs. More girls than boys participated (See Table 1); children's mean age was similar in both the control and intervention groups. Most children were white and experienced spinal fusions or another type of orthopedic surgery. There were no significant differences between groups with the exception of surgical procedure; more children experienced spinal fusions and other orthopedic surgeries in the experimental group. As seen in Table 2, parents were generally well educated and earned incomes of greater than \$60,000.

Pain Levels

As shown in Figure 2, on a scale of 0 to 10, children's mean NRS pain scores ranged from 4.41 to 3.78 (control group) and 4.80 to 4.29 (intervention group) and decreased over each successive day of the 3 post-discharge days in both the control and intervention groups. We found no significant differences in mean pain scores between the two groups. When controlling for procedure, the mean pain scores between the two groups were still not significantly different while different procedures had slightly different pain scores ($p = .04$). Because few children ($n = 8$) reported FPS-R scores, and because there were no significant differences between children's NRS and FPS-R scores, we eliminated FPS-R scores in this analysis of pain levels and for analgesics administered.

Analgesics Administered

As shown in Figure 3, parents administered mean percentages of 66.68% to 43.29% (control group) and 70.07% to 55.19% (intervention group) of available analgesics to children reporting NRS pain scores. Parents administered fewer analgesics over each successive day of the 3 post-discharge days in both the control and intervention groups. Parents in the intervention group administered greater amounts of analgesics on all 3 days than did parents in the control group, but not significantly greater amounts (Day 1 $p = .51$, Day 2 $p = .43$, Day 3 $p = .19$). After controlling for procedure type, no significance was detected in analgesics administered between the two groups, while different procedures were significantly

correlated with the different percentages of analgesics administered on Day 2 ($p = .007$) and Day 3 ($p = .031$).

For the total sample on all 3 study days, there were mild to moderate significant correlations between the amounts of analgesics administered by parents and children's NRS pain levels ($r = .20$ to $.37$, $p < .05$). When analyzing the correlations across the study days for the total sample, there were strong correlations between parents' administration of analgesics on Day 1 and Day 2 ($r = .86$, $p < .0001$) and between Day 2 and Day 3 ($r = .85$, $p < .0001$).

However, analysis by correlation alone does not capture a true clinical picture of the relationship between pain levels and analgesics administered. Based on prior research, we tricotomized pain scores and analgesics administered into high, medium, and low (Van Hulle Vincent & Denyes, 2004) across the 3 study days. Results showed that some children (control $n = 11$, intervention $n = 12$) reported low mean pain scores (0 to ≤ 3) and received moderate to high amounts of analgesics ($> 33\%$ to 100%) while a few children in the control group ($n = 7$), none in the intervention group, reported moderate to high pain (> 3 to 10) and received low analgesics (0% to $\leq 33\%$).

When we made our calls to parents at home, parents told us they liked using the Pain Log to keep a record of their children's pain and for analgesics administered. They also asked us questions about analgesic administration. For example, when a range of 1 to 2 pills were ordered, parents asked how they were to know whether to give 1 or 2 pills. When a physician or nurse told them to "wean" the analgesics, parents asked us how they were supposed to wean.

Satisfaction

Parents' and children's satisfaction with pain levels was high overall and is reported in Table 3. When we compared satisfaction versus not satisfied/not sure, children reported satisfaction with pain levels significantly more often after the intervention than before; there were no significant differences in parents' satisfaction between control and intervention groups.

Unplanned Healthcare

Few parents in the study used unplanned healthcare services. Parents reported calling the healthcare provider, usually for additional or a change in analgesics and to treat constipation; 18% in the control group called the healthcare provider whereas 27% called in the intervention group. One parent in the control group needed to take their child to the emergency room for pain management support. There were no significant differences in use of unplanned healthcare services between control and intervention groups.

Expectations

When we asked parents if they had thought about their children's pain at home after surgery, 106 shared their expectations and concerns. The most frequently voiced issues were about analgesic administration (44% of parents) and included concerns if analgesics would be sufficient, about transition from the hospital to home regimen, and about side effects. Some parents (16%) told us that they expected their children to be in pain and 9% expected the pain to be manageable. Other issues that parents reported were concerns about being able to manage their children's pain (19%), concerns about pain interfering with their children's activities/function (15%), and the desire to keep children comfortable (13%); 9% told us that they had not thought about their children's pain.

Unlike their parents, children's ($n = 97$) most frequent response was that they had not thought about pain (30%) and some (13%) were confident that their pain would be well-

managed at home. Children, like their parents, voiced concern about pain interfering with their activities/function (14%).

Discussion

Our study of parents' management of their children's pain at home is one of the first to evaluate children's pain after inpatient surgery (requiring hospitalization for at least 23 hours). Our findings revealed that parents who received our HPMC intervention administered more analgesics to their children; however, this increase was not significantly different from parents in the control group. Children's pain did not decrease in the intervention group. Based on our results, it is clear that our written instructions and brief interactive session were not sufficient to change parents' analgesic administration practices to relieve their children's pain. Parents did tell us that they enjoyed participating in the study and appreciated use of the Pain Log as a helpful way to monitor their children's pain.

One encouraging finding is that about one-quarter of all children in the study reported low mean pain levels and received moderate to high amounts of analgesics, suggesting that their parents administered amounts of analgesics to relieve, and perhaps to prevent, pain. Also, there were no children with moderate to severe pain receiving low amounts of analgesics in the intervention group (7 in control), although this was not a significant difference and the number of children in this category was small. The strong correlations between analgesics administered by parents on Day 1 and Day 2, and on Day 2 and Day 3 indicate that parents who gave analgesics initially continued to administer analgesics on successive days.

In spite of children reporting moderate pain levels, parents administered about two-thirds to one-half of the amount of analgesics available by physician order. This means that parents administered lower doses (e.g., administered 1 tablet when 1 to 2 tablets were ordered) and/or fewer numbers of doses per day (e.g., administered analgesics every 6 hours when ordered every 4 hours). Parents' lack of administration of adequate analgesics to relieve their children's pain could be due to their misconceptions about pain management and concerns about analgesics used as reported in prior research (Helgadóttir & Wilson, 2004; Rony et al., 2010; Simons & Roberson, 2002; Zisk et al., 2007). Also, parents could have been discrediting their children's pain intensity self-report as reported in prior research with nurses (Van Hulle Vincent & Denyes, 2004; Van Hulle Vincent & Gaddy, 2009; Van Hulle Vincent, Wilkie, & Szalacha, 2010). Further research is needed to determine how to better educate parents about pain management and to correct their knowledge deficits and misconceptions leading to adequate analgesic administration.

Parents administered fewer analgesics over each of the 3 consecutive days. This finding is consistent with other reports about parents' administration of PRN analgesics (Chambers et al., 1997; Fortier et al., 2009; Sutters et al., 2004; Zisk et al., 2008). Taken together, these findings raise the notion that parents might expect their children's pain to decrease each day after surgery and thus expect their children to need fewer analgesics on each successive day, when in fact, pain can increase once the child is home and becomes more active. This pattern of analgesic administration needs to be studied in future research.

Overall children's pain scores were moderate throughout this study with scores in the intervention group actually a bit higher than in the control group. These results are similar to those of other investigative teams unable to show significant results after their intervention (Chambers et al., 1997; Romsing et al., 1998; Sutters et al., 2004) in spite of parents in intervention groups administering significantly more analgesics on at least one study day (Chambers et al., 1997; Sutters et al., 2004). In HPMC, we may not have sufficiently taught parents the importance of administering analgesics ATC when pain was expected; Sutters et

al. (2010) was able to show decreased pain levels when acetaminophen with hydrocodone was administered ATC to children after tonsillectomy. Furthermore, our inability to detect significant differences in children's pain levels may have been due to an insufficient number of subjects to detect these differences, especially for a small effect size.

Another possible contributor to why we were unable to show effectiveness of our intervention may have been because our written materials contained too much information for parents to grasp during their children's stressful postoperative recovery period, thus, preventing them from focusing on key information such as giving analgesics regularly to relieve pain. Also, a videotape or Internet-based interactive program (available in the hospital and to take home) may be more successful in addressing parents' and children's knowledge gaps and misconceptions. Greenberg and colleagues (Greenberg, Billett, Zahurak, & Yaster, 1999) improved 50 parents' misconceptions about children's pain management after viewing a 19-minute videotape presentation as compared to the 50 parents who did not view the videotape. In a study of nurses, Van Hulle Vincent, Wilkie, and Wang (2011) showed that an improvement in nurses' beliefs about pain management also resulted in nurses' administration of significantly more analgesics and decreases in children's pain; the same could be true for parents.

Most parents and children in the entire study reported satisfaction with pain levels. There was no difference for the parent intervention group in contrast to prior research (Huth et al., 2003; Seid & Varni, 1999). Surprisingly, more children reported being satisfied with their pain levels in the intervention group in spite of their moderate levels of pain. Satisfaction measures are complex and often skewed to the positive (Gordon et al., 2005). Thus, this measure may not have been a sensitive outcome in this research.

Parents used few unplanned health services in this study with no significant differences after the intervention. And, in fact, parents in the intervention group contacted their physician or nurse more often than parents in the control group. This increase in the intervention group may have inadvertently resulted from our teaching, which provided parents with information about pain management (e.g., treat constipation) that they then asked their healthcare provider about after discharge. Findings in this study are in contrast to prior research (Seid & Varni, 1999) in which fewer parents in the intervention group called their physician for concerns after surgery.

Expectations voiced by parents included concerns about analgesic administration including sufficiency of analgesics to control pain, side effects, and transition from the hospital to home regimen. Children and parents voiced concern about pain interfering with activities/function. These possible concerns need to be addressed during discharge teaching.

We note limitations for this study with the sample, measures, and control. Our sample was one of convenience, and our intervention and control groups were not randomized. Our measure of analgesics administered and pain levels included use of a pain log. As with any self-report instrument, parents' documentation in the pain log may not always have been accurate. Parents may have recorded higher pain scores for their children because they thought they needed to justify analgesic administration. Furthermore, although many investigators such as Rony et al. (2010), Seid and Varni (1999), and Sutters et al. (2004; 2010) have used logs or diaries to collect pain variables, few investigators (Ely, Dampier, Gilday, O'Neal, & Brodecki, 2002; Maikler, 2000; Stinson et al., 2008; Wiggins & Foster, 2007) tested the psychometric properties of logs/diaries. In regard to control, while the HPMC intervention was administered by trained nurses using a script, usual care was provided by any nurse on the unit and was not consistent. We did not control for confounding variables such as anxiety. Taken together, these limitations contribute to a lack

of generalizability and threaten the rigor and validity of the study. In spite of these challenges, our findings contribute to what is known about parents' management of children's pain at home after surgery.

How Might This Information Affect Nursing Practice?

Our findings contribute to knowledge about parents' management of their children's pain at home after inpatient surgery. After our intervention, parents administered more analgesics on two study days but this increase was not significant nor was it sufficient to relieve their children's pain. Although we did not measure parents' misconceptions in this study, their insufficient analgesic administration could be due to their misconceptions about pain management and concerns about analgesic use as reported in prior research, and about discrediting their children's pain intensity self-report. Nurses must assess parents' knowledge about pain assessment and treatment, assist parents to identify their misconceptions and gaps in knowledge, and help them overcome their misconceptions and concerns by educating them on the best pain practices. Nurses can then educate parents about assessing their children's pain, the advantages of relieving children's pain, the expected adverse effects of opioids including constipation, and the incidence of addiction. Nurses need to be certain that parents thoroughly understand the directions for administering analgesics at home. Furthermore, nurses and other healthcare providers must have state of the science knowledge to guide parents about their children's pain management at home after surgery and must model best pain practices when children are in the hospital. Further research is needed to develop and test effective education interventions for parents (and children when appropriate) to facilitate relief of children's pain.

Acknowledgments

This research was funded by a Shaw Nursing Faculty Collaborative Research Grant from Children's Memorial Hospital, Chicago IL. This project was also supported by the University of Illinois at Chicago (UIC) Center for Clinical and Translational Science (CCTS), Award Number UL1RR029879 from the National Center For Research Resources. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center For Research Resources or the National Institutes of Health. We thank all of the children and parents who participated in our study.

References

- American Pain Society. Principles of analgesic use in the treatment of acute pain and cancer pain. 6. Glenview, IL: American Pain Society; 2008.
- Bero, LA.; Grilli, R.; Grimshaw, JM.; Harvey, E.; Oxman, AD.; Thomson, MA. Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings; British Medical Journal. 1998. p. 465-468. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1113716/?tool=pubmed>
- Bieri D, Reeve RA, Champion GD, Addicoat L, Ziegler JB. The Faces Pain Scale for the self-assessment of the severity of pain experienced by children: Development, initial validation, and preliminary investigation for ratio scale properties. Pain. 1990; 41(2):139–150.10.1016/0304-3959(90)90018-9 [PubMed: 2367140]
- Chambers CT, Reid GJ, McGrath PJ, Finley GA, Ellerton ML. A randomized trial of a pain education booklet: Effects on parents' attitudes and postoperative pain management. Children's Health Care. 1997; 26(1):1–13.10.1207/s15326888chc2601_1
- Ely B, Dampier C, Gilday M, O'Neal P, Brodecki D. Caregiver report of pain in infants and toddlers with sickle cell disease: Reliability and validity of a daily diary. The Journal of Pain. 2002; 3(1):50–57.S1526590002141642 [PubMed: 14622854]
- Fortier MA, MacLaren JE, Martin SR, Perret-Karimi D, Kain ZN. Pediatric pain after ambulatory surgery: Where's the medication? Pediatrics. 2009; 124(4):e588–595.10.1542/peds.2008-3529 [PubMed: 19736260]

- Gordon DB, Dahl JL, Miaskowski C, McCarberg B, Todd KH, Paice JA. American Pain Society recommendations for improving the quality of acute and cancer pain management: American Pain Society Quality of Care Task Force. *Archives of Internal Medicine*. 2005; 165(14):1574–1580.10.1001/archinte.165.14.1574 [PubMed: 16043674]
- Greenberg, RS.; Billett, C.; Zahurak, M.; Yaster, M. Videotape increases parental knowledge about pediatric pain management; *Anesthesia and Analgesia*. 1999. p. 899-903.Retrieved from <http://www.anesthesia-analgesia.org/content/89/4/899.long>
- Helgadóttir HL, Wilson ME. Temperament and pain in 3- to 7-year-old children undergoing tonsillectomy. *Journal of Pediatric Nursing*. 2004; 19(3):204–213.10.1016/j.pedn.2004.01.009 [PubMed: 15185249]
- Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: Toward a common metric in pediatric pain measurement. *Pain*. 2001; 93(2):173–183.10.1016/S0304-3959(01)00314-1 [PubMed: 11427329]
- Homer JJ, Swallow J, Semple P. Audit of pain management at home following tonsillectomy in children. *The Journal of Laryngology and Otology*. 2001; 115(3):205–208.10.1258/0022215011907208 [PubMed: 11244527]
- Huang, H-Y.; Wilkie, DJ.; Zong, S-P.; Berry, D.; Hairabedian, D.; Judge, MK.; Chabal, C., et al. Developing a computerized data collection and decision support system for cancer pain management; *Computers, Informatics, Nursing*. 2003. p. 206-217.Retrieved from <http://journals.lww.com/cinjournal/pages/default.aspx>
- Huth MM, Broome ME. A snapshot of children's postoperative tonsillectomy outcomes at home. *Journal for Specialists in Pediatric Nursing*. 2007; 12(3):186–195.10.1111/j.1744-6155.2007.00111.x [PubMed: 17594298]
- Huth MM, Broome ME, Mussatto KA, Morgan SW. A study of the effectiveness of a pain management education booklet for parents of children having cardiac surgery. *Pain Management Nursing*. 2003; 4(1):31–39.10.1053/jpmn.2003.7 [PubMed: 12707866]
- Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: A comparison of six methods. *Pain*. 1986; 27(1):117–126.10.1016/0304-3959(86)90228-9 [PubMed: 3785962]
- Jha A, Suarez ML, Ferrans CE, Molokie R, Kim YO, Wilkie DJ. Cognitive testing of PAINReportIt in adult African Americans with sickle cell disease. *Computers, Informatics, Nursing*. 2010; 28(3):141–150.10.1097/NCN.0b013e3181d7820b
- Jonas DA. Parent's management of their child's pain in the home following day surgery. *Journal of Child Health Care*. 2003; 7(3):150–162.10.1177/13674935030073002 [PubMed: 14516009]
- Kankkunen P, Vehviläinen-Julkunen K, Pietilä AM, Kokki H, Halonen P. Parents' perceptions and use of analgesics at home after children's day surgery. *Paediatric Anaesthesia*. 2003; 13(2):132–140.10.1046/j.1460-9592.2003.00998.x [PubMed: 12562486]
- Kankkunen PM, Vehviläinen-Julkunen KM, Pietilä AM, Halonen PM. Parents' perceptions of their 1-6-year-old children's pain. *European Journal of Pain*. 2003; 7(3):203–211.10.1016/S1090-3801(02)00100-3 [PubMed: 12725842]
- Leddy, KM.; Wolosin, RJ. Patient satisfaction with pain control during hospitalization; *Joint Commission Journal on Quality and Patient Safety/Joint Commission Resources*. 2005. p. 507-513.Retrieved from <http://www.ingentaconnect.com/content/jcqh/jcjq>
- Maikler VE. Diaries as a method of data collection with children. *Journal of Child and Family Nursing*. 2000; 3(1):65–70. [PubMed: 11022483]
- Mitchell, A.; Boss, BJ. Adverse effects of pain on the nervous systems of newborns and young children: A review of the literature; *Journal of Neuroscience Nursing*. 2002. p. 228-236.Retrieved from <http://journals.lww.com/jnnonline/pages/default.aspx>
- Romsing J, Hertel S, Harder A, Rasmussen M. Examination of acetaminophen for outpatient management of postoperative pain in children. *Paediatric Anaesthesia*. 1998; 8(3):235–239.10.1046/j.1460-9592.1998.00768.x [PubMed: 9608969]
- Rony RYZ, Fortier MA, Chorney JM, Perret D, Kain ZN. Parental postoperative pain management: Attitudes, assessment, and management. *Pediatrics*. 2010; 125(6):e1372–1378.10.1542/peds.2009-2632 [PubMed: 20498177]

- Seid M, Varni JW. Pediatric day surgery outcomes management: The role of preoperative anxiety and a home pain management protocol. *Journal of Clinical Outcomes Management*. 1999; 6(2):24–30.
- Simons J, Roberson E. Poor communication and knowledge deficits: Obstacles to effective management of children's postoperative pain. *Journal of Advanced Nursing*. 2002; 40(1):78–86.10.1046/j.1365-2648.2002.02342.x [PubMed: 12230532]
- Stinson JN, Stevens BJ, Feldman BM, Streiner D, McGrath PJ, Dupuis A. Construct validity of a multidimensional electronic pain diary for adolescents with arthritis. *Pain*. 2008; 136(3):281–292.S0304-3959(07)00375-210.1016/j.pain.2007.07.002 [PubMed: 17723279]
- Sutters KA, Miaskowski C. Inadequate pain management and associated morbidity in children at home after tonsillectomy. *Journal of Pediatric Nursing*. 1997; 12(3):178–185.10.1016/S0882-5963(97)80075-9 [PubMed: 9198341]
- Sutters KA, Miaskowski C, Holdridge-Zeuner D, Waite S, Paul SM, Savedra MC. A randomized clinical trial of the effectiveness of a scheduled oral analgesic dosing regimen for the management of postoperative pain in children following tonsillectomy. *Pain*. 2004; 110(1-2):49–55.10.1016/j.pain.2004.03.008 [PubMed: 15275751]
- Sutters KA, Miaskowski C, Holdridge-Zeuner D, Waite S, Paul SM, Savedra MC, Mahoney K, et al. A randomized clinical trial of the efficacy of scheduled dosing of acetaminophen and hydrocodone for the management of postoperative pain in children after tonsillectomy. *The Clinical Journal of Pain*. 2010; 26(2):95–103.10.1097/AJP.0b013e3181b85f98 [PubMed: 20090434]
- Taddio A, Katz J, Ilersich AL, Koren G. Effect of neonatal circumcision on pain response during subsequent routine vaccination. *Lancet*. 1997; 349(9052):599–603.10.1016/S0140-6736(96)10316-0 [PubMed: 9057731]
- Tesler MD, Savedra MC, Holzemer WL, Wilkie DJ, Ward JA, Paul SM. The word-graphic rating scale as a measure of children's and adolescents' pain intensity. *Research in Nursing & Health*. 1991; 14(5):361–371.10.1002/nur.4770140507 [PubMed: 1891622]
- Unsworth V, Franck LS, Choonara I. Parental assessment and management of children's postoperative pain: A randomized clinical trial. *Journal of Child Health Care*. 2007; 11(3):186–194.10.1177/1367493507079558 [PubMed: 17709354]
- Van Hulle Vincent C, Denyes MJ. Relieving children's pain: Nurses' abilities and analgesic administration practices. *Journal of Pediatric Nursing*. 2004; 19(1):40–50.10.1016/j.pedn.2003.09.006 [PubMed: 14963869]
- Van Hulle Vincent C, Gaddy EJ. Pediatric nurses' thinking in response to vignettes on administering analgesics. *Research in Nursing & Health*. 2009; 32(5):530–539.10.1002/nur.20337 [PubMed: 19504564]
- Van Hulle Vincent C, Wilkie DJ, Szalacha L. Pediatric nurses' cognitive representations of children's pain. *The Journal of Pain*. 2010; 11(9):854–863.10.1016/j.jpain.2009.12.003 [PubMed: 20418172]
- Van Hulle Vincent C, Wilkie DJ, Wang E. Pediatric nurses' beliefs and pain management practices: An intervention pilot. *Western Journal of Nursing Research*. 2011; 33(6):825–845.019394591039168110.1177/0193945910391681 [PubMed: 21172923]
- von Baeyer CL, Spagrud LJ, McCormick JC, Choo E, Neville K, Connelly MA. Three new datasets supporting use of the Numerical Rating Scale (NRS-11) for children's self-reports of pain intensity. *Pain*. 2009; 143(3):223–227.10.1016/j.pain.2009.03.002 [PubMed: 19359097]
- Warnock FF, Lander J. Pain progression, intensity and outcomes following tonsillectomy. *Pain*. 1998; 75(1):37–45.10.1016/S0304-3959(97)00202-9 [PubMed: 9539672]
- Weisman, SJ.; Bernstein, B.; Schechter, NL. Consequences of inadequate analgesia during painful procedures in children; *Archives of Pediatrics and Adolescent Medicine*. 1998. p. 147-149.Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9491040>
- Wiggins SA, Foster RL. Pain after tonsillectomy and adenoidectomy: "Ouch it did hurt bad". *Pain Management Nursing*. 2007; 8(4):156–165.10.1016/j.pmn.2007.07.002 [PubMed: 18036503]
- Wilkie, DJ.; Molokie, R.; Boyd-Seal, D.; Suarez, ML.; Kim, YO.; Zong, S.; Wang, ZJ., et al. Patient-reported outcomes: Nociceptive and neuropathic pain and pain barriers in adult outpatients with sickle cell disease; *Journal of the National Medical Association*. 2010. p. 18-27.Retrieved from http://www.nmanet.org/index.php/Publications_Sub/jnma

- Wilson ME, Helgadóttir HL. Patterns of pain and analgesic use in 3- to 7-year-old children after tonsillectomy. *Pain Management Nursing*. 2006; 7(4):159–166.10.1016/j.pmn.2006.09.005 [PubMed: 17145490]
- Winer, BJ. *Statistical principles in experimental design*. 3. New York: McGraw-Hill; 1991.
- Zisk RY, Grey M, MacLaren JE, Kain ZN. Exploring sociodemographic and personality characteristic predictors of parental pain perceptions. *Anesthesia and Analgesia*. 2007; 104(4):790–798.10.1213/01.ane.0000257927.35206.c1 [PubMed: 17377084]
- Zisk RY, Grey M, Medoff-Cooper B, MacLaren JE, Kain ZN. The squeaky wheel gets the grease: Parental pain management of children treated for bone fractures. *Pediatric Emergency Care*. 2008; 24(2):89–96.10.1097/PEC.0b013e318163db77 [PubMed: 18277844]

Figure 1. Diagram showing flow of participants through study. Data for control group collected from March 19, 2007 to July 18, 2008. Data for intervention group collected from February 11, 2009 to April 15, 2010.

Figure 2.
Children's mean pain scores on NRS scale of 0 to 10 for all 3 study days.

Figure 3.
Mean percentage of analgesics administered by parents on all 3 study days to children reporting NRS scores.

Table 1

Demographic Characteristics-Children

	NRS		FPS-R		All	
	Control	Intervention	Control	Intervention	Control	Intervention
Child Characteristics	(n = 49)	(n = 50)	(n = 6)	(n = 2)	(n = 55)	(n = 52)
Age	M 13.7 SD 2.4	M 13.6 SD 2.0	M 13.2 SD 3.5	M 9.0 SD 1.4	M 13.7 SD 2.5	M 13.4 SD 2.2
Gender, %						
Male	30.6	30	50	50	32.7	30.8
Female	69.4	70	50	50	67.3	69.2
Race/Ethnicity, %						
White	77.6	80	66.7	100	76.4	80.8
Black/African American	6.1	6	16.7	0	7.3	5.8
Hispanic/Latino	6.1	4	0	0	5.5	3.9
Asian	2	2	16.7	0	3.6	1.9
Other	8.2	8	0	0	7.3	7.7
Surgical Procedure, %						
Spinal Fusion	65.3	64	66.7	50	65.5	63.5
Other Orthopedic	12.2	30	0	0	10.9	28.9
Chest	10.2	0	0	0	9.1	0
Head & Neck	6.1	0	16.7	0	7.3	0
Abdominal	4.1	0	0	0	3.6	0
Urological	2.0	6	16.7	50	3.6	7.7

Note. M = Mean. Not all totals = 100% due to rounding

Table 2

Demographic Characteristics-Parents

		Control	Intervention
		(<i>n</i> = 55)	(<i>n</i> = 52)
Parent Characteristics			
Highest Education, %	Graduate/Professional Degree	33.3	19.2
	College	27.5	38.5
	Some College	25.5	30.8
	High School	13.7	11.5
Income, %	\$100,000 or more	43.6	32.7
	\$60,000-99,999	23.6	32.7
	\$30,000- 59,999	16.4	19.2
	Less than \$30,000	5.5	1.9
	No response	11.0	13.5

Note. Not all totals = 100% due to rounding

Table 3

Parents' and Children's Satisfaction with Pain Level

		Control	Intervention
		Parents <i>n</i> = 46	Parents <i>n</i> = 44
		Children <i>n</i> = 45	Children <i>n</i> = 38
Level of Satisfaction		# (%)	# (%)
Satisfied	Parents	38 (82.6)	38 (86.4)
	Children	33 (73.3)	35 (92.1)
Unsatisfied	Parents	8 (17.4)	6 (13.6)
	Children	5 (26.7)	3 (7.9)

Children: $\chi^2 = 4.90$, *df* = 1, *p* = 0.03