Pain Management of Children Aged 5 to 10 Years After Adenotonsillectomy

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Purpose: The undertreatment of pediatric pain has been widely researched and continues to be a concern for health care professionals. Adenotonsillectomy is a common pediatric surgery associated with a moderate-to-high level of postoperative pain. The purpose of this study was to increase understanding of the current pain management practices provided to children aged 5 to 10 years undergoing adenotonsillectomy and identify areas for improvement.

Design: A retrospective descriptive design was used.

Methods: An extensive review of the literature on pediatric pain management after adenotonsillectomy provided the evidence to compare against the care currently provided at our institution. A retrospective chart review of 100 children who have undergone outpatient adenotonsillectomy surgery over a 6-month period was conducted.

Findings: Patients who received combination opioid analgesic medications either intraoperatively or during Phase I had significantly lower pain scores in Phase II than those who received monotherapy in either setting.

Conclusions: The combination of drug therapy and parental presence may be helpful in decreasing pain and postanesthesia care unit length of stay. Exploration of the role of nonpharmacologic pain management techniques such as distraction, guided imagery, music, and the use of ice collars in conjunction with analgesic therapy is needed.

Keywords: pain management, pediatric, tonsillectomy, surgery, peri-anesthesia nursing, research.

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PEDIATRIC PAIN MANAGEMENT is and has been a concern for health care professionals. At times, the management of pain in children is suboptimal. Research has shown that pain medications in the pediatric population are underused.1-3 This underutilization can be attributed to several factors including nursing and parental concerns.

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Conflict of interest: None to report.

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Adenotonsillectomy is an extremely common, painful surgical intervention in the pediatric population.\textsuperscript{1,3,5,6} It is also a surgery where many of the patients go home the same day or within 23 hours after the procedure. Pain management for these patients is one of the primary nursing concerns in the pediatric postanesthesia care unit (PACU). Preparing caregivers to continue adequate pain management at home is vital. Recent clinical practice guidelines for tonsillectomy in children were designed to identify areas for improvement and refine our pain management strategies in children undergoing adenotonsillectomy. 

**Purpose**

The purpose of this study was to describe the current pain management of children (aged 5 to 10 years) in the PACU after adenotonsillectomy. Exploring relationships between demographics and pain management variables were the key areas of focus for this study.

**Literature Review**

Use of a sample of children undergoing adenotonsillectomy is a powerful model for the study of postoperative pain because of the large numbers of children undergoing this procedure.\textsuperscript{5,7} Approximately, 1,500 children undergo adenotonsillectomy annually in this pediatric tertiary care center. In addition to being a common surgery, adenotonsillectomy is a procedure associated with moderate-to-high complaints of pain postoperatively and for the first few days after the procedure.\textsuperscript{3,6} Children have more pain after adenotonsillectomy as compared with other types of outpatient surgery.\textsuperscript{9,11} Because this is a high volume procedure with a high incidence of pain, examining pain management in this population is valuable to many pediatric patients and their health care providers.

Despite advances in pain management, research shows that children’s pain is often undertreated.\textsuperscript{10} Researchers report that children in the hospital often receive analgesics in subtherapeutic doses and at less than optimal intervals.\textsuperscript{3} Children are not always able to participate in addressing their pain concerns and are dependent on health care professionals for pain reduction interventions. In one study, pediatric nurses attributed higher pain scores to children who expressed their pain vocally and were more likely to administer analgesics to children who were more vocal about their pain.\textsuperscript{10}

Based on the study institution’s pain standard of care, children aged between 5 and 10 years can provide self-report of pain using the Wong/Baker Faces tool\textsuperscript{12} or a numeric visual analog scale. The use of various pain measurement tools has aided nurses in identifying levels of pain for patients who are less vocal. Behavioral pain observation tools are also used by health care professionals to determine the need for analgesics.\textsuperscript{10} Because children cannot always take an active role in their pain management, it is imperative that nurses have a better understanding and knowledge of pain management.

Pain management issues unique to the pediatric PACU include heightened anxiety, a potentially altered sensorium making it difficult for self-report of pain, and an unfamiliar environment that can appear very frightening (eg, face masks).\textsuperscript{1,13}

Being able to report and discuss pain issues is a valuable way to address concerns and develop a pain management plan. However, nurses cannot or do not always assess children’s pain effectively.\textsuperscript{14} To improve pain management, nurses need to acknowledge the relevance of pain assessment and management.\textsuperscript{4,14,15} Some reasons cited in the literature for inadequate pain management in children include:

- Child’s age and difficulty with self-report
- Nurses’ clinical judgment (can be influenced by their beliefs and attitudes)
- Pain assessment, rather than total amount of analgesic, should be the outcome of choice to evaluate pain management
- Myths and misconceptions regarding pediatric pain management (eg, fear of addiction)\textsuperscript{3,4,6} wonder if holding this myth correlates with vaccine myths

In the hospital setting, nurses often underestimate children’s pain after adenotonsillectomy.\textsuperscript{10} So, of no surprise, studies still report that children experience significant pain postoperatively.\textsuperscript{4,14}
Additional research regarding patterns of pain intensity and analgesic use in the hospital may be helpful in developing interventions to improve pain management in children after adenotonsillectomy. The impetus to critically examine current practice and to implement improvements in practice is an important developmental goal for nursing staff.

Study Design
An exploratory retrospective chart review was used to assess clinical practice for pain management of adenotonsillectomy patients. To gather information about the nature of pain and its treatment, 100 charts of patients aged between 5 and 10 years who had an adenotonsillectomy over a 6-month period were reviewed. The study was approved by The Children’s Hospital of Philadelphia institutional review board.

Setting
This study was conducted in a PACU located in a free-standing, 400-bed tertiary care children’s hospital at an academic medical center. Approximately 1,500 adenotonsillectomies are done per year at the main hospital. Patients receive Phase I and Phase II care in the same space without transfer. Patients are discharged home after completing recovery in this unit. Parental visitation in the PACU is the norm.

Sample
Of the nearly 1,500 children who underwent adenotonsillectomy in 2008, more than 800 were aged between 5 and 10 years. With the goal of exploring pain management practice for this target population, we decided to review charts from the previous 6 months, January 2009 to July 2009, or 400 patients. Inclusion and exclusion criteria for chart selection are listed below.

Inclusion criteria were:
1. Children aged 5 to 10 years
2. Outpatient adenotonsillectomy between January 1, 2009 and June 30, 2009
3. Complete chart that is, 100% of the documentation present for variables being collected

so the kid who coded and the paperwork was lost in the kerfuffle was probably excluded....
used to identify pain aided in understanding the severity of pain. An important aspect in pain management is the child’s previous experience with pain. This can give needed information that aids in helping to enhance the pain management for the patient. The chart review documentation tool was organized to encompass all of these variables.

To assure inter-rater reliability, two of the coinvestigators piloted the chart review tool until 90% consistency was reached. The study investigators trained a work-study student to perform chart audits and established inter-rater reliability. Frequent audits of extracted data were performed for consistency and reliability.

The data were retrieved from both electronic and paper sources and entered into an electronic database. During the data collection process, one investigator randomly audited 10% of the charts to assess that our data collection remained consistent. During the data collection process, one investigator randomly audited 10% of the charts to assure inter-rater reliability. Two of the coinvestigators piloted the chart review tool until 90% consistency was reached. The study investigators trained a work-study student to perform chart audits and established inter-rater reliability. Frequent audits of extracted data were performed for consistency and reliability.

**Data Analysis**

Data from the chart review were entered into an Excel (Microsoft Office, 2003, Microsoft, Redmond, WA) spreadsheet and then imported into SPSS version 16.0 (SPSS Inc, Chicago, IL) for analysis. Descriptive statistics (mean, median, and standard deviation) were used to report data for each relevant variable. Relevant data about the pain medication provided the recorded pain scores, and the amount of time the child needed to recover from surgery were also calculated using descriptive statistics. In cases when pain scores were elevated over time, factors such as patient age and the adequacy of medications ordered and administered to relieve pain were analyzed using correlational statistics and analysis of variance (ANOVA). These data provided important information that identified variables influencing adequate or inadequate pain management for this group of children.

**Results**

The charts of 100 children aged 5 to 10 years (mean: 7.2 years ± 17 months, 52% male, 46% White, 37% Black/African American, and 2% Asian) provided data for analysis. Most children (82%) were surgery naive and 68% had no previous hospitalizations. Cautery was by far the most common surgical technique used (91% of the sample; Table 1).

Table 1. Sample Characteristics (N = 100)

<table>
<thead>
<tr>
<th>Variables</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>46</td>
</tr>
<tr>
<td>Black/AA</td>
<td>37</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
</tr>
<tr>
<td>Age (y)</td>
<td>M = 7.2 (±17 mo)</td>
</tr>
<tr>
<td>Previous hospitalizations</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>68</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>&gt;2</td>
<td>2</td>
</tr>
<tr>
<td>Previous surgeries</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>82</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Surgical technique</td>
<td></td>
</tr>
<tr>
<td>Cautery</td>
<td>91</td>
</tr>
<tr>
<td>Coblation</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
</tbody>
</table>

AA, African American.

The BMI was calculated for each subject based on their recorded height and weight (Table 2). Of interest was to discover if the current increase in pediatric obesity would be reflected in this population of children undergoing adenotonsillectomy. One-quarter of the children were above the 97th percentile for BMI and an additional 13% were between the 90th and 97th percentile, whereas only nine children were at or below the 10th percentile. More than half the subjects (52%) were at or above the 75th percentile. Girls (n = 20) and...
boys (n = 18) were equally distributed in the BMI groups at or above the 90th percentile, whereas of the nine children at or below the 10th percentile, seven were girls and two were boys. Subjects were grouped by low (9%), normal (57%), or high (38%) BMI for analysis.

Pain Scores and Analgesic Administration

In the PACU, in both Phases I and II, nurses used the Faces, Legs, Activity, Cry, and Consolability (FLACC) scale to assess pain in 66% of the patients. This behavioral pain assessment scale provides a metric of 0 to 10 with no pain equal to zero up to a maximum of 10. Because many of the patients are sleeping or groggy from anesthesia, self-report is often difficult. Self-report pain scales used included the Wong/Baker Faces scale, a series of cartoon faces with a 0 to 10 metric or a 0 to 10 numeric rating scale. Each of the scales used has a common metric of 0 to 10. Nurses’ judgment determined the scale choice at the time of assessment.

Pain assessments were completed when the child arrived from the operating room (OR) and frequently (as often as every 15 minutes) during their PACU stay in an effort to determine the effectiveness of analgesic medication and the progression of the patient’s status. Pain assessments followed the child’s recovery and pain management trajectory so that timing of assessments was variable. To compare pain assessments during the recovery period with other relevant variables, the first score recorded in Phase I and the first score recorded when the patient reached Phase II were analyzed to assure consistency and equivalency of the comparisons. Mean pain scores did not differ significantly by gender in either Phase I (males, M = 2.96; females, M = 3.32; P = .647) or Phase II (males, M = 1.28; females, M = 1.33; P = .920) time points. As such, gender was not included as a covariate in any further analysis. Additionally, no significant differences were found for pain scores at the start of Phases I and II based on race, number of previous hospitalizations, or surgeries.

Total time in PACU was analyzed using nonparametric statistics owing to unequal numbers and indicated no statistically significant difference by surgical technique (P = .12). Average time in the PACU was 122.2 minutes (median: 115, range: 60-229 minutes) for the 91 patients who had cauterity compared with the average time of 139.5 minutes for the six patients with coblation (median: 134.5, range: 110-183 minutes).

Pain scores at the start of Phase I recovery ranged from 0 to 10 with a slight bimodal distribution (M = 3.43, standard deviation [SD] = 3.83). A total of 56 of the children had a score of zero with an additional 4 at a score of 4 or less, 16 children scored between 5 and 7, and 23 children scored between 8 and 10. Thus, one-third of the children had a score ranging 5 or greater, interpreted as moderate-to-severe pain. The first pain assessment in Phase II recovery indicated lower pain scores on average (M = 1.3, SD = 2.22) with 76 children at or below a score of 4 and only eight children at 5 or above.

All pain medications administered to the children were recorded including drug, dose, route, and time. Most patients (61%) received intravenous (IV) morphine only in the OR, 14 patients received IV fentanyl only, whereas one-quarter (n = 25) of the patients received a combination of IV morphine and fentanyl. Average pain scores by group were

Table 3. Relationship Between Analgesics Administered in the Operating Room (OR) and Phases I and II Pain Scores and Length of Stay (LOS)

<table>
<thead>
<tr>
<th>Medications Administered in OR</th>
<th>Number of Patients</th>
<th>Phase I Pain Score (Mean)*</th>
<th>Phase II Pain Score (Mean),</th>
<th>LOS in PACU, min (Mean [Minimum-Maximum])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine IV (0.1-0.2 mg/kg)</td>
<td>61</td>
<td>2.73</td>
<td>1.2</td>
<td>124.3 (60-229)</td>
</tr>
<tr>
<td>Fentanyl IV (0.5-2 mcg/kg/dose)</td>
<td>14</td>
<td>2.86</td>
<td>2.6</td>
<td>119.9 (80-190)</td>
</tr>
<tr>
<td>Morphine IV and fentanyl IV</td>
<td>25</td>
<td>4.29</td>
<td>0.7</td>
<td>123.6 (80-195)</td>
</tr>
</tbody>
</table>

PACU, postanesthesia care unit; IV, intravenous.
*Average of first pain score at beginning of Phases I and II.
| P < .05. |

Hey! What’s this doing here? This section seems to have been abducted from the Methods Section! how did they compare means? probably a t-test, but should mention that. But where are the SD? sloppy...

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PACU, postanesthesia care unit; IV, intravenous.
*Average of first pain score at beginning of Phases I and II. 
**P < .05. **
compared at both the start of Phase I and Phase II to determine the effect of intraoperative analgesics on pain score. As can be seen in Table 3, subjects who received combination opioid analgesic medications intraoperatorily had significantly lower average pain scores in Phase II (M = 0.7, P < .045, F = 3.22) than those who received monotherapy. Those same subjects had higher mean pain scores at the start of Phase I (M = 4.29), which may explain why they were rigorously treated for pain during Phase I, resulting in a lower mean pain score in Phase II. Mean length of stay in the PACU was not significantly different based on analgesics provided in the OR. Length of stay was based on when the patient arrived into the PACU for Phase I to when they left to go home.

Table 4. Relationship Between Analgesics Administered in Phase I on Pain Scores and Length of Stay (LOS)

<table>
<thead>
<tr>
<th>Medications Administered in Phase I</th>
<th>Number of Patients</th>
<th>Phase I Pain Score (Mean)*,\dagger</th>
<th>Phase II Pain Score (Mean)*,\dagger</th>
<th>LOS in PACU, min (Mean [Minimum-Maximum])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine IV (0.1-0.2 mg/kg)</td>
<td>25</td>
<td>2.88</td>
<td>1.74</td>
<td>124.7 (80-229)</td>
</tr>
<tr>
<td>Oxycodone PO (0.05-0.1 mg/kg)</td>
<td>9</td>
<td>0.56</td>
<td>2.44</td>
<td>125.8 (93-150)</td>
</tr>
<tr>
<td>Morphine IV and oxycodone PO</td>
<td>49</td>
<td>3.94</td>
<td>0.54</td>
<td>121.1 (60-203)</td>
</tr>
</tbody>
</table>

PACU, postanesthesia care unit; IV, intravenous; PO, by mouth.

*Average of first pain score at beginning of Phases I and II.
\daggerP < .05.
\daggerP = .01.

A similar difference was seen when comparing Phase II pain scores with analgesics administered during Phase I (Table 4). In this case, subjects (n = 49) who received both morphine IV and oxycodone by mouth (PO) had significantly lower pain scores at the start of Phase II (M = 0.54, P = .01) than did subjects receiving either analgesic alone. Length of stay did not differ. Analgesics administered during Phase II included oxycodone alone (n = 32) or in combination with acetaminophen (n = 2); the remaining three subjects received both IV morphine and oxycodone PO during Phase II (Table 5). Because of the small numbers of subjects in two of the three groups, statistical analysis by group was not appropriate.

Table 5. Relationship Between Analgesics Administered in Phase II on Pain Scores and Length of Stay (LOS)

<table>
<thead>
<tr>
<th>Medications Administered in Phase II</th>
<th>Number of Patients</th>
<th>Phase II Pain Score (Mean)*</th>
<th>LOS in PACU, min (Mean [Minimum-Maximum])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxycodone PO</td>
<td>32</td>
<td>1.93</td>
<td>127.5 (80-211)</td>
</tr>
<tr>
<td>Oxycodone PO and acetaminophen (15-20 mg/kg)</td>
<td>2</td>
<td>0</td>
<td>126.5 (91-162)</td>
</tr>
<tr>
<td>Oxycodone PO and morphine IV</td>
<td>3</td>
<td>2.33</td>
<td>102.6 (80-143)</td>
</tr>
</tbody>
</table>

PACU, postanesthesia care unit; PO, by mouth; IV, intravenous.

*Average of first pain score at beginning of Phase II.
that as Edward Tufte would say

in this study. How would you design a study to take the next step in

The greatest limitation of this study was reliance on charted data without the ability to clarify. For example, although we know anecdotally that non-pharmacologic pain management techniques such as music and positioning are used, they were not charted and therefore were not captured. Additionally, the data represent practice at one institution, although demographic characteristics have been described so like institutions can compare these findings to their patient population.

Implications

One of the purposes of this study was the identification of areas for improving pain management. The combination of drug therapy and parental presence may be helpful in decreasing pain and PACU length of stay. Exploration of the role of non-pharmacologic pain management techniques such as distraction, guided imagery, music, and the use of ice collars in conjunction with analgesic therapy

ice collars are 1930s tech
is needed. Future research directions could include identification of patient characteristics and interventions, which lead to effectively managed or undermanaged pain. This data will also guide staff in pilot testing different pain management nursing interventions.

References


