Objective The purpose of this study was to examine parental management of acute dental pain in children.

Methods: This IRB approved study consisted of a survey of parents bringing children to Nationwide Children's Hospital's emergency walk-in dental clinic.

Results: Data from 300 children-parent dyads were included in this analysis. The mean age of children was 8 years 8 months, and mean duration of pain was 17.7 days. Seventy-Six percent of children were treated with at least one dose of over-the-counter pain medication. Acetaminophen was the most commonly used (40%), followed by ibuprofen (37%). Age was the most significant response variable with over 40% of the categories being clinically significant. Younger children were less likely to have received OTC analgesia for dental pain (p=.048)

Conclusion: Acute dental pain in children is being mismanaged with children waiting more than 17 days for treatment. Age is the most significant response variable.
ACKNOWLEDGEMENTS

First and foremost I have to say thank you to my beautiful wife Kandice for all your support through these past 6 years of dental education. Your dedication to my education at times surpassed even my own. You are always there for me and for that I am forever grateful.

Thank you to my research advisor Dr. Thikkurissy, for without your help this project would have never even gotten past the initial stages. Your ideas and thoughtful insights were what kept this project alive. I owe you so much more than just a simple thank you. You have given me education, friendship, and hopefully a little wisdom as well. I have been truly lucky to have been able to learn at your feet.

Thank you as well to my thesis committee. Thank you for all the comments and insight. Your reviews and rewrites have been critical to the final product. Thank you for your guidance and valued opinions.

Thank you as well to Jessica Kull for your help with the data entry. You went above and beyond to volunteer to help me and you never let me down.

Last but not least thank you to the clinic staff and my fellow residents. In order to complete this project I had to rely on you so much for your help and you never let me down. Thank you for all those times I had to interrupt treatment to complete my surveys. You were all so wonderfully patient and I could never have done it without you!

iii
VITA

November 22, 1978.........Born – Logan, Utah

2005.................................. B.A. Medical Biology, University of Utah

2007.................................. D.D.S. Ohio State University

2007 – present.................... Pediatric Dental Resident and Graduate Teaching Associate, The Ohio State University College of Dentistry, Department of Pediatric Dentistry

FIELDS OF STUDY

Major Field: Dentistry
Area of Emphasis: Pediatric Dentistry
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>iii</td>
</tr>
<tr>
<td>Vita</td>
<td>iv</td>
</tr>
<tr>
<td>List of Tables</td>
<td>vii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>viii</td>
</tr>
</tbody>
</table>

Sections:

1. Introduction ................................................. 1
2. Materials and Methods
   2.1 Design ................................................. 8
   2.2 Sample ............................................... 8
   2.3 Instrument .......................................... 8
   2.4 Statistics/Analysis ............................. 10
3. Results
   3.1 Demographic Information ....................... 11
   3.2 Treatment Rendered ............................. 12
   3.3 Pain Scale Measurements ..................... 13
   3.4 Regression Analysis ............................ 14
4. Discussion
   4.1 Demographics ....................................... 16
   4.2 Care Seeking Behaviors ....................... 18
   4.3 Parental Dosing of Pediatric Analgesia .... 20
   4.4 Sources of Dosing Information ............... 22
   4.5 Weaknesses and Difficulties .................. 23
5. Conclusions ............................................... 25
Page

List of References…………………………………………………………………………………………………………………………..26

Appendices:
Appendix (A), Sample of Survey…………………………………………………………………………………………………29
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Family Level Variables of Enrolled Subjects</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>FACES Pain scale level and duration child was in pain</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>Results of regression analysis</td>
<td>14</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure

1  Wong-Baker FACES Pain Rating Scale.........................................12
Introduction

On June 30th, 1906 the original *Food and Drugs Act* was passed by Congress and signed into law by President Theodore Roosevelt. It prohibited interstate commerce in ‘misbranded and adulterated foods, drinks and drugs’, and created the first group governmentally organized and empowered to monitor the safety and effectiveness of pharmaceutical agents. From those modest beginnings the FDA has grown into a multi-billion dollar funded agency with over 9,000 employees. Today the FDA has on file over 100,000 available over-the-counter (OTC) medications containing approximately 800 significant active ingredients used in various formulations and marketed as “safe and effective”. There are over 80 therapeutic categories of drugs formulated and marketed for over-the-counter use.¹

Researchers have, for years studied trends in medication taken over-the-counter specifically for at-home pain relief. Two medications in particular- ibuprofen (IBU) and acetaminophen (APAP) - have received the majority of this scrutiny. APAP and IBU are the most widely used pain control measures in an over the counter preparations with APAP being significantly ahead in numbers than IBU.² Hundreds of products worldwide carry APAP as one of its therapeutic ingredients. The number of individuals turning to over-the-counter medication has also been increasing.³ It is a reasonable assumption that with more medications continuing to be approved for over-the-counter use these numbers will continue to rise. More than 700 drugs are available today as OTC formulations that 30 years ago would have been available by prescription only.⁴
Despite the substantial body of literature examining the management, (OTC and prescription), of acute pediatric pain, there is a relative paucity of literature examining the use of OTC pain medication for acute pain of dental origin in children.

Questions relevant to discussions on OTC medications are: How are they being used, and for what? Are they being used properly, and who is primarily using them? Most of the limited research focusing on pre-visit medication for acute pain in children has been done with reference to limb injury, the most common medical acute pain situation for which OTC medication is used.\textsuperscript{5,7} Interestingly, most studies on pre-hospital pain medication by caregivers, and even EMS personnel en-route, found that the biggest problem was under-dosing of the pediatric patient, i.e., most patients with moderate or severe pain levels did not receive therapeutic levels of pain medication.\textsuperscript{5-10} This was especially true for younger patient populations.\textsuperscript{11} Watkins\textsuperscript{12} found that no child under 5 years old arriving to an ED with EMS personnel had received pain medication, compared to 51\% of children 5-15 years old.

This is not a situation present in pediatric populations only. Swor et al. demonstrates no differences in rates of pediatric vs. adult pre-hospital pharmacological analgesia (21\% vs. 26\%) administered by EMS en route to the hospital.\textsuperscript{8} The perceived side effect for caregiver and EMS oligoanesthesia would be prolonged suffering by the pediatric patient, although the study by Maimon et al. found no significant difference between pain scores reported by children who received analgesic medications before arriving to the ED and those who did not.\textsuperscript{7} Although acute limb injuries may be the closest approximation to acute dental pain in the literature, there are some distinct differences. A limb injury is often an acute medical emergency for which patients and
caregivers generally seek immediate treatment. “Acute” dental pain levels may at times escalate gradually from mild to moderate to severe levels, or may be severe for a time and then return to mild only to flare up again later. Caregivers may habitually delay seeking treatment for their child’s dental pain, sometimes waiting to see if it gets better. Furthermore, caregivers may have difficulty finding a dentist who will treat children on an emergency basis, or even one who will take their certain kind if insurance. This situation increases the chances the child will experience prolonged painful situations in which mismanagement of their pain is more likely to occur. One of our suppositions is that acute dental pain in the pediatric population may be mismanaged in similar ways to that of acute limb injuries, but possibly for longer periods of time.

Many reasons have been theorized as to why caregivers have not given needed pain relief prior to seeking emergent medical help. One theory is that adults perceive pain in children is not the same as adult pain, or they underestimate the pain of the child.13,14 Studies have shown that this perception is highly suspect- children experience pain at the same levels of acuity as do adults.15,16 Uncertainty as to routes of administration, pediatric drug dosing and perceived discomfort in the care of an injured child may also be barriers to treatment.7 Studies are inconclusive as to whether parents are accurate judges of their children’s actual pain levels. When discrepancies exist, parents, again, tend to underestimate the child’s pain levels, possibly serving as another barrier to adequate pain relief.17-20

When parents do attempt to alleviate their children’s pain at home, the majority of time their dosages are incorrect. One such study by Li et al. found that out of 200 patients <10yrs of age, who were given a known dose of APAP or IBU, 51% received an
inaccurate dose, including 62% of patients given APAP and 26% given IBU. Infants less than 1 year of age were more at risk of being given an inaccurate dose. Infants are less tolerant of inaccurate dosing (especially side effects related to over-dosage), and are at greater susceptibility to morbidity associated with inaccurate dosing.

Understanding caregiver attitudes concerning OTC medication usage is important when trying to assess medicines given to children. Studies about caregivers’ knowledge and practices in treating themselves would be applicable as they are responsible for administering pain medication to children. In 2001, the National Council on Patient Information and Education commissioned a national survey of more than 1000 adults and 450 health professionals to assess their attitudes and beliefs concerning OTC medication. That survey found that one-third of Americans have taken more than the recommended dose of their OTC medication, believing it increases the effectiveness of the product, and 41% believe that non-prescription formulations are too weak to cause any harm. Only one in ten Americans reads the label for potential adverse effects when buying a new product and only 34% of the public could even identify the correct active ingredient in their preferred brand of pain reliever.

In reference to the administration of OTC medication to children only one in ten (11%) caregivers correctly stated that medications formulated for babies are usually more concentrated than those for older children, with 51% of respondents incorrectly stating that infant dosages are usually less concentrated. One-fifth (21%) correctly identified weight alone as the correct method of dosage calculation for children. Concerns of accidental overdose of certain active ingredients through polypharmacy are ever-present in the pediatric population.
Thirty-six percent of Americans say they are likely to combine nonprescription medications when experiencing more than one symptom, such as a sore throat, cold and a toothache or headache.

In one study directly highlighting this need for further caregiver education concerning pediatric analgesic dosage, a mock acute pediatric pain scenario was presented to caregivers presenting to an urban tertiary pediatric care center with non-emergent concerns. The study scenario required them to measure correct dosages of APAP for their child. Eighty-eight percent of caregivers reported giving some type of OTC medication to their children in the past 2 months, with 44% giving more than one. Sixty-six percent of these caregivers reported having used Tylenol® products but only 8% of these same caregivers reported having used acetaminophen. In the scenario, 40% stated the correct dosage for their child, yet only 67% of those accurately measured the amount they intended. Actual measured doses ranged from 8% to 210% of the caregiver-stated intended dose. In the end, 40% measured the correct dose for their child, although one-third of those occurred strictly by chance by incorrectly measuring an improper intended dose! Thirty percent of caregivers could demonstrate both an accurate dose and accurate measurement for their child.

Health literacy has been shown to be another obstacle to proper dosing and administration of pediatric OTC pain medications. Labels are written at or higher than 8th-grade reading levels. Estimates published by the National Assessment of Adult Literacy in 2003 reported that 43% of adults in the United States read at the lowest levels of reading proficiency, with 19.6% of American adults reading at or below a 5th grade ability and 33% are between 6th and 10th grade. A study by Davis, TC et al. found that
approximately half of adults surveyed in a multi-site study of primary care patients were unable to read and correctly state 1 or more of the label instructions on 5 common prescriptions.25 Many of the medications that children take for other ailments such as colds, coughs and the flu have APAP as part of their formulation, so it is difficult for caregivers to determine how much pain medication their child is actually getting, let alone how much to augment it in an acute pain situation.

OTC pain medications are safe and effective when used in correct dosages and for limited amounts of time, but there are serious potential side effects when they are abused, and in some cases even within therapeutic margins in certain susceptible individuals. Acetaminophen, in particular, has received much attention in the past few years due to its potentially deadly side-effect: acute liver failure (ALF). APAP was approved for use in the 1950’s (OTC in 1960) but incidences of APAP-induced ALF were not well reported in the United States until the 1980’s. (Although interestingly, the official journal of the American Academy of Pediatrics released a “Commentary on Acetaminophen” in 1975 outlining the potential adverse affects of APAP misuse.26) Between 1982 and 1987 as news about the potential association of aspirin and Reye’s syndrome reached the public, more and more children and adults turned to APAP as the “safer” alternative. Since then, more studies have confirmed the association between APAP and liver toxicity. Most notably, a recent study by Larson et al. found the proportion of APAP-induced ALF has alarmingly increased between 1998 (21%) and 2003 (51%), with unintentional inaccurate dosing accounting for 48% of the cases.27 APAP is now the leading known cause of acute liver failure in the United States. APAP has been shown to induce acute liver failure even within therapeutic dosages of 4g/day.28 Between 1995 and 1999
acetaminophen was the leading cause of poisoning in the United States. The Food and Drug Administration now warns consumers that all over-the-counter pain relievers should be taken with care to avoid serious problems that can occur with misuse. Even further, the FDA is proposing new labeling that will inform consumers of the risk of liver toxicity from products containing acetaminophen, the risk of GI bleeding from the use of products containing NSAIDs, and factors that may increase these risks.1

The objectives of this study are to survey and assess caregivers’ attitudes and beliefs concerning types and dosage of OTC medication for acute dental pain in children. With the results of this study, we may be better equipped to understand intentions and then educate caregivers on appropriate types, dosages, and applications of OTC drugs for dental pain relief in children.
Materials and Methods

1. Design

This prospective observational type study used cross sectional data gathering. The Nationwide Children’s Hospital (NCH) Institutional Research Board approved this survey.

2. Sample

Selection

Subjects included in this study were primary caregivers of patients presenting to the emergency walk-in clinic at Nationwide Children's Hospital Dental Clinic with any complaint involving current or past history of oral, facial, or head and neck pain of dental origin.

Criteria

1. Child currently experiencing pain of dental origin, or who has experienced pain of dental origin associated with presenting need.

2. Caregiver is English speaking, i.e. not requesting or needing assistance from a translation service.

3. Instrument

Source

Many of the questions were derived from questions given in a national survey administered for the National Council on Patient Information and Education (NCPIE), performed by HarrisInteractive Market Research, January 2003.
Pilot Testing

The methodology consisted of a 20 question pilot survey (with an additional demographic information section) to assess instrument validity and health literacy. The pilot survey was administered by one individual from the research team. Questions were presented in the same manner to each subject and in the same order in an attempt to reduce bias and increase reliability, generalizability, and validity.

For the pilot portion, ten questionnaires were given with this researcher-administered survey design and responses were evaluated for reliability and validity. The survey was condensed; and redundant or confusing questions were altered or removed. As a result of the pilot survey it was decided to change survey design from a structured interview design to a self-administered survey design. More modifications were applied to streamline survey and make it more readable and understandable to our intended patient population. The revised survey was then given to the health literacy department within NCH for evaluation to assure a final survey within the reading level parameters of our patient population. The final survey consisted of a demographic section and 18 self-administered questions, all at or below an 8th grade health literacy level.

Final Administration

The demographic section included questions about location and length of pain experienced, age, weight, health history and insurance coverage of child in question and information concerning mother’s ethnicity, education, and number of children in household. The following 18 questions address types of medication used for current pain situation, any other medications currently being taken, and how caregivers decided on what type of medicine and at what dosage. Questions were also included asking
caregivers to identify the active ingredients in common OTC medications. A Wong and Baker FACES® pain scale was also included to assess caregiver perception of pain before and after the pain medication was administered.

4. Statistics/Analysis

A database was compiled using Microsoft Excel 2002 (Microsoft, Washington) to gather study data and enable statistical analysis. Each study patient was given a number as their identifier so as to detach identifiable personal information on the study participants from their responses. Personally identifying information was retained with the signed consent forms, detached from the survey instruments, and stored in a secure location. Only the new number is logged into the database along with caregiver responses thereby accomplishing anonymity. Charts were pulled for surveys that lacked important information in the demographic section or did not have the diagnosis/treatment on the front cover and the missing info was recovered as available. Once all information was gathered as available data was analyzed using JMP 2.1 and SAS 9.13. The database was analyzed using descriptive analysis, two-tailed t-test and regression analysis. Ordinal variables such as pain scale score, ages and duration of pain were analyzed using two-tailed t-test. Responses to the 18 questions were analyzed by Demographic variables using multivariable logistic regression. Statistical significance was determined at $p \leq 0.05$. 
Results

Demographic Information
Data were collected from 300 children who presented to the Nationwide Children’s Dental Clinic with a chief complaint of ‘dental pain’. The mean age of children was 8 years 7 months (SD 3 years 2 months). Children were in pain for a mean of 17.7 days (SD 37.8), with 49 children (16%) waiting 30 days or more in pain. Regression analysis did detect a significant association between the duration the child waited in pain and the age of the patient (p=.016). Older children were in pain longer. Out of the total cohort of 300 patients, 239 (79.7%) reported insurance status. Of these children, 195 (81%) of those who reported insurance status were on some form of public insurance (Medicaid), 43 (18%) were on private insurance and 0.4% (1) had no coverage. Sixty-nine percent (184) were classified as Class I according to the American Society of Anesthesiologists Physical Status rating scale, with 31% (83) classified as ASA II. Of the children who had chronic health conditions, the majority (45%) had a diagnosis of asthma or reactive airway followed by 39% with ADHD/ADD. The remaining 16% of children had other medical conditions such as; autism spectrum disorders, learning disabilities, congenital heart defects, renal dystrophies and rheumatoid arthritis. The majority of respondents noted maternal ethnicity as Caucasian (162/62%), followed by African American (84/32.2%). One hundred and sixty-six respondents reported 2-3 children in their households (59.9%) with 71 reporting 4 or more children (25.7%). Family level variables are summarized in Table 1.
<table>
<thead>
<tr>
<th>Maternal Ethnicity</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>162</td>
<td>62.1</td>
</tr>
<tr>
<td>African American</td>
<td>84</td>
<td>32.2</td>
</tr>
<tr>
<td>Somali</td>
<td>8</td>
<td>3.1</td>
</tr>
<tr>
<td>Asian American</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>Maternal Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;High School</td>
<td>53</td>
<td>22.2</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>85</td>
<td>35.6</td>
</tr>
<tr>
<td>Some College</td>
<td>55</td>
<td>23.1</td>
</tr>
<tr>
<td>College Graduate</td>
<td>35</td>
<td>14.6</td>
</tr>
<tr>
<td>Some Trade School</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>Trade School Graduate</td>
<td>8</td>
<td>3.3</td>
</tr>
<tr>
<td>Children in Household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>14.4</td>
</tr>
<tr>
<td>2-3</td>
<td>166</td>
<td>59.9</td>
</tr>
<tr>
<td>4 or more</td>
<td>71</td>
<td>25.7</td>
</tr>
<tr>
<td>Insurance Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>43</td>
<td>18</td>
</tr>
<tr>
<td>Public</td>
<td>195</td>
<td>81.6</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Table 1. Family Level Variables of Enrolled Subjects

*Treatment Rendered*

Treatment rendered the day of the appointment was broken into 5 distinct categories; extraction, restorative therapy, pulp therapy, referral to another specialty clinic, and no treatment. The majority of patients treated (59%) were treated by extraction of the offending teeth/tooth followed by 15% who received pulp therapy, 9% who received no treatment, 8% who were treated with restorative dentistry, 7% who were referred to another specialty clinic (most often oral and maxillofacial surgery), and 1% who received palliative treatment.
Pain Scale Measurements

There was a significant association between the treatment rendered and the reported pre-operative pain level. (p=.03) Those who received definitive treatment such as extraction had higher reported pain levels than those who received no treatment or referrals to another specialty. Question 14 asked caregivers to ‘describe the pain your child is in today’, and had 3 response options; minimal, moderate and severe. Question 15 asked caregivers to specifically quantify the child’s pain levels as ‘the worst pain your child has experienced during this episode’. Nationwide Children’s Hospital uses a Wong-Baker FACES scale from 0-10 to rate pain. Figure 1

![Wong-Baker FACES Pain Rating Scale](image)


Figure 1: Wong Baker FACES Pain Rating Scale

When asked what was the ‘worst pain during the episode in question’, the total mean reported pain level was 6.9 out of 10. From the 281 children for whom there was a reported pain score, 21.4% (60) were described as ‘minimal’, although the mean of their ‘worst reported pain’ mean 6.1. The children that were rated as having ‘moderate’ pain (53%/149) had a mean FACES score of 7.2. There were a total of 72 children (25.6%)
whose pain was rated as ‘severe’ as whose FACES scale was a mean of 8.1. Table 2 demonstrates the mean duration the child was in pain in relation to their identified pain level and mean FACES pain scale.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Worst pain on FACES scale</th>
<th>Mean Duration child was in pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>60</td>
<td>6.1</td>
<td>12.9 days</td>
</tr>
<tr>
<td>Moderate</td>
<td>149</td>
<td>7.2</td>
<td>19.6 days</td>
</tr>
<tr>
<td>Severe</td>
<td>72</td>
<td>8.1</td>
<td>18.5 days</td>
</tr>
</tbody>
</table>

Table 2. FACES pain scale level and duration child was in pain.

Regression Analysis

Table 3 presents the results of the multivariate regression analysis for the 18 asked questions. Each question is compared to eight independent variables and statistically significant associations are outlined in red. The age of the patient had the most significant associations with responses to the questions, with 43% of it’s categories being statistically significant.

Please refer to questionnaire in appendix section for reference to questions.
<table>
<thead>
<tr>
<th></th>
<th>q1</th>
<th>q2</th>
<th>q3</th>
<th>q4</th>
<th>q5</th>
<th>q6</th>
<th>q8</th>
<th>q9</th>
<th>q11</th>
<th>q12</th>
<th>q13</th>
<th>q14</th>
<th>q15</th>
<th>q16</th>
<th>q17</th>
<th>q18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx</td>
<td>0.082</td>
<td>0.091</td>
<td>0.141</td>
<td>.05*</td>
<td>0.467</td>
<td>0.334</td>
<td>0.368</td>
<td>.034*</td>
<td>0.447</td>
<td>0.171</td>
<td>0.326</td>
<td>.03*</td>
<td>0.073</td>
<td>0.249</td>
<td>0.218</td>
<td>.003*</td>
</tr>
<tr>
<td>Insurance</td>
<td>0.038*</td>
<td>0.192</td>
<td>0.342</td>
<td>0.223</td>
<td>0.231</td>
<td>0.064</td>
<td>0.204</td>
<td>0.163</td>
<td>.05*</td>
<td>0.32</td>
<td>0.448</td>
<td>0.29</td>
<td>0.303</td>
<td>0.458</td>
<td>0.463</td>
<td>0.373</td>
</tr>
<tr>
<td>ASA</td>
<td>0.177</td>
<td>0.228</td>
<td>0.439</td>
<td>&lt;.0001*</td>
<td>0.161</td>
<td>0.422</td>
<td>0.428</td>
<td>0.438</td>
<td>0.47</td>
<td>0.082</td>
<td>0.386</td>
<td>0.322</td>
<td>0.056</td>
<td>.026*</td>
<td>0.22</td>
<td>0.416</td>
</tr>
<tr>
<td>Mat.Ethn</td>
<td>0.224</td>
<td>0.226</td>
<td>0.031*</td>
<td>0.236</td>
<td>.016*</td>
<td>0.288</td>
<td>.020*</td>
<td>0.032</td>
<td>0.451</td>
<td>.042*</td>
<td>0.4</td>
<td>0.129</td>
<td>0.347</td>
<td>.0004*</td>
<td>0.099</td>
<td>0.155</td>
</tr>
<tr>
<td>Child HSE</td>
<td>0.061</td>
<td>0.126</td>
<td>0.385</td>
<td>.05*</td>
<td>0.45</td>
<td>0.092</td>
<td>0.342</td>
<td>0.407</td>
<td>0.178</td>
<td>0.437</td>
<td>0.169</td>
<td>0.487</td>
<td>0.384</td>
<td>0.341</td>
<td>.016*</td>
<td>0.123</td>
</tr>
<tr>
<td>Mat Ed</td>
<td>0.147</td>
<td>0.452</td>
<td>0.262</td>
<td>0.419</td>
<td>.0006*</td>
<td>0.491</td>
<td>0.069</td>
<td>0.463</td>
<td>0.463</td>
<td>0.475</td>
<td>0.137</td>
<td>0.196</td>
<td>0.464</td>
<td>.024*</td>
<td>0.424</td>
<td>0.284</td>
</tr>
<tr>
<td>Dur Pain</td>
<td>0.179</td>
<td>.002*</td>
<td>0.139</td>
<td>0.389</td>
<td>0.18</td>
<td>.039*</td>
<td>0.365</td>
<td>0.343</td>
<td>.045*</td>
<td>0.079</td>
<td>0.061</td>
<td>0.322</td>
<td>0.203</td>
<td>0.365</td>
<td>.041*</td>
<td>0.469</td>
</tr>
<tr>
<td>Age Pt</td>
<td>0.193</td>
<td>.016*</td>
<td>.048*</td>
<td>0.426</td>
<td>0.234</td>
<td>0.167</td>
<td>0.218</td>
<td>0.154</td>
<td>0.312</td>
<td>.024*</td>
<td>.002*</td>
<td>.0001*</td>
<td>.022*</td>
<td>0.277</td>
<td>0.117</td>
<td>.001*</td>
</tr>
</tbody>
</table>

Table 3. Results of Regression Analysis. (*= Statistical significance)

Q1- Seen a dentist?
Q2- How long has tooth hurt
Q3- OTC meds for pain
Q4- Any other meds
Q5- Active ingredient in Tylenol
Q6- Most accurate way to dose
Q7- Any negative reaction to OTC meds
Q8- More than recommended dose y/n
Q9- Info on which meds
Q10- Info on what dose
Q11- Income
Q12- Aspirin question
Q13- Needs stronger meds?
Q14- Describe pain
Q15- FACES before
Q16- Active ingredient in Motrin
Q17- How did you determine dose?
Q18- FACES after

For copy of questionnaire see appendix (A)
Discussion

Patient autonomy concerning at-home medical management has been a major debate in recent years. Having the patient manage their own, or their dependent’s, minor aches and pains OTC may reduce pain levels, time spent suffering and may reduce overall burden to the medical system as visits to urgent care centers and emergency rooms would most likely decrease. Conversely, mismanagement of OTC formulations may only serve to add to the medical burden as incidence of adverse reactions and overdoses increase and patients experience increased or prolonged suffering due to improper doses and under-management. These issues are even more important when pain is experienced by children, who are not autonomous. Their health is exclusively dependent on a third party- the caregiver or guardian, who may have limited knowledge and/or health literacy. Caregiver’s attitudes and beliefs concerning their own health care management can not and should not be applied to children. Literature has shown at times this may be the case, so developing an understanding of what motivates caregivers can better help providers understand how acute pain control is applied to children.

Demographics

Three hundred caregivers were enrolled in the study- surpassing our initial target N of 150. Sixty-two percent were Caucasian and 32% were African American. Only 8 Somali, 4 Asian American and 3 Hispanic subjects were included in study. This is an under-representation of individuals that make up a large amount of the minority population in Columbus and the clinic base at Nationwide Children’s Hospital. This is
due to the fact that these ethnic groups are more likely to need translation services which would disqualify them as participants in our study. Therefore the results can not be applied to those subsets of our population. Of those respondents, 22.2% had less than a high school education, with more than 79% at least high school graduates. Our survey was written and verified to be “at or below an 8th grade” health literacy level by our hospital. The majority (59.9%) of caregivers identified as having 2-3 children in their household, with another 25.7% having 4 or more. Increases in family size may have an effect on the attention one individual child receives and the abilities caregivers have to attend to their complaints of pain. When compared in our study, number of children in the household was not significantly related to time in pain. Further studies would have to be performed to analyze all factors contributing to delay in seeking definitive care.

The mean age of children was 8.6 years with a standard deviation of 3.2 years. Age of patient was the most clinically significant demographic determinant with 43% of categories having significant association. Age was significantly related to how long the child had been in pain before treatment (p=.016) and to whether the child was likely to have received any medication for pain (p=.048). Older children were likely to be in pain longer and younger children were less likely to have received any OTC medicine for their pain. Child’s age was also related to caregivers reported analysis of child’s pain preoperatively (p=.0001) and before (p=.022) and after (p=.001) administration of pain medicine. Older children were more likely to have higher values of pain reported. This is consistent with other studies reviewing pain medicine in children. Young age has been shown to be a contributing factor in child’s likelihood to have received pain medication for acute medical pain, and parents typically underestimate younger children’s pain.12, 19–20
Sixty-nine percent of children were ASA I according to the American Society of Anesthesiologists Physiological Status scale with no compounding medical condition. The other 31% were categorized as ASA II. Of those with chronic health conditions 45% had asthma or other airway issues and 39% were diagnosed with ADD/ADHD. Parents and caregivers may have differing tolerances for child’s pain or complaints of pain if those children have a compounding medical condition on top of acute dental pain. In our study ASA status was not significantly related to amount of pain the caregiver expressed or to time the child was in pain. As per the parameters of the study all patients were experiencing some form of dental pain. Of those three hundred surveyed, 281 caregivers reported a pain score- 21.4% were minimal, 53% reported moderate and 25.6% rated their child’s pain as severe. Treatment rendered was significantly related to pain levels experienced preoperatively and pain levels after OTC medication was given (p=.03 and p=.003 respectively). Those children that received definitive treatment such as extraction for their acute dental need had higher reported pain scores. On the day of the appointment the majority of treatment rendered (59%) was extraction of the offending tooth or teeth, followed by 24% who where treated with other types of definitive treatment methods thereby eliminating the painful stimulus. Only 9% required no treatment for their pain and 7% were referred to other specialty clinics, primarily OMFS.

*Care Seeking Behaviors*

Acute pain studied in children of non-dental origin has primarily been done on limb injuries such as fractures that are very hard to ignore for long periods of time. Treatment
is sought almost immediately and most studies concentrate on medication given by caregivers or EMS personnel at the scene of the accident or en route to the hospital or care center. Conversely, dental pain is often neglected or discounted for a period of time before definitive treatment is sought. Pain may be experienced for days at a time before children even approach their caregivers.

In our sample of 300 children experiencing acute dental pain, the average time spent in pain before obtaining definitive care was 17.7 days. Forty-nine children (16%) were identified as being in pain for more than 30 days. There are many factors that may contribute to delayed presentation for treatment. Lack of insurance coverage could be a reason to delay or neglect immediate treatment. However, in our sample only one caregiver that presented with a child in pain stated they had no insurance coverage. Eighty-one percent of patients had some form of public insurance which generally cover most emergent dental procedures in children at 100%. The other 18% identified as having private insurance. Not all caregivers identified insurance status- 79.7% listed their type of insurance coverage, so data is not complete in this area. Pain levels too low to necessitate immediate treatment may also be a reason to delay. Often “acute” dental pain is gradual in onset and high levels of pain may take days or weeks to develop. Caregivers may wait until pain levels are perceived to be at a maximum before seeking treatment. In this study, the average FACES pain score for the children identified as only being in ‘minimal’ pain was 6.1 out of 10. Most children presented in ‘moderate’ pain (7.2 out of 10, average) and 72 children’s pain score was reported as ‘severe’. There was an interesting relation between severity of pain and duration of pain before receiving treatment. Those reported as having ‘minimal’ pain waited an average of 12.9 days-
much less than the overall average of 17.7 days. Those reporting moderate or severe pain at presentation waited longer, 19.6 and 18.5 days respectively. Many other life and family situations must have contributed to the time between onset and seeking relief for dental pain. In regression analysis this is known as the “omitted variables bias”. It is probable that many other confounding stressors interfered with the caregiver’s ability to identify and then appropriately seek treatment for their child’s dental pain. Further study would be needed to tease out the details regarding the concerns and factors that impede or negate caregiver’s proper and prompt care for acute dental pain in children.

*Parental Dosing of Pediatric Analgesia*

Twenty-three percent of caregivers (69) did not attempt to alleviate their child’s pain pharmacologically. Of those who did, 37% (110) gave Acetaminophen alone or in combination with another type of pain reliever. Forty-one percent (122) gave Ibuprofen alone or in combination. Twelve percent gave Acetaminophen and Ibuprofen. The most common pain relieving aide given besides IBU and APAP was Orajel® (benzocaine) (15%).

Medical literature has consistently demonstrated that adults and caregivers improperly manage acute pediatric pain. Problems exist in improper pain medicines, dosage amounts and dosage regimens. Caregiver’s knowledge and attitudes about OTC pain medicines determine their application to pain relief in children. Among other things, this survey addressed knowledge of common pain medications available over-the-counter and how the caregivers applied that knowledge in dosage decisions for acute pain of dental origin. When asked the question, ‘What do you think is the most accurate way to determine the amount of medicine in a single dose for a child under the age of 12?’
18% (55) responded correctly by answering weight alone. Eighty-two percent of caregivers did not know the correct way to dose medications in children. The 2001 National Council on Patient Information and Education (NCPIE) commissioned survey found that only 21% could correctly identify weight as the correct method for dosage in children. And when asked ‘where did you get the information on what dose of OTC pain medicine to give your child’, 36% (109) responded ‘directions on medication bottle’. Most of the common OTC medications formulated for children have dosages on the label by weight and then by age. But just knowing the age of the child is inadequate for dosing OTC meds, particularly with the wide variability in weight possible at any given age.

With over 100,000 medications available OTC, containing over 800 active ingredients, it is no doubt a daunting task to even determine the correct medicine, let alone the correct dose. Though medicines like Tylenol® and Motrin® are common-place in homes across the country, many have little knowledge concerning their active ingredients. When asked to identify the active ingredient in Tylenol®, 38% (115) answered incorrectly. Thirty-eight percent (113) of responders could also not identify the correct ingredient in Motrin®. Each of these questions were significantly related to maternal education (p=.006 and .026 respectively). In the NCPIE survey only 34% could identify the active ingredient in their preferred pain reliever. Although the FDA and pediatricians everywhere have discouraged use of Aspirin as a pain reliever in some children there are still some doubts as to its application in general. Specifically Aspirin should not be used in younger children who have had a recent viral illness. With its status as a ‘relative contraindication’ in children, specifically with a history of recent viral illness, many caregivers may be confused as to its proper applicability in their specific
situation. When asked to agree or disagree with this statement ‘Aspirin is an effective pain medication to give my child’, 12% (35) responded ‘agree’ and 26% (70) responded ‘don’t know’ with a total of 38% (105) incorrect or unsure. Eight caregivers admitted to giving aspirin to their children, 5 of which were under the age of 10. Misinformation and frustration with lack of knowledge in which medications to give and then on how to give them may lead to abandonment of OTC pain relief in general for something stronger- and potentially more dangerous. Twenty-eight percent of caregivers responded ‘yes’ to the question ‘Do you think your child needs pain medication that is stronger than over-the-counter for the pain they are reporting today?’. This response was significantly related to age of patients with caregivers of older children more likely to feel that stronger medicine is needed for their child’s pain (p=.002).

Sources of Dosing Information

With this amount of confusion surrounding at-home pain control it is important we understand where caregivers are getting their information. Two questions in our survey addressed this issue. When asked where caregivers get the information on which OTC pain medicine to give to their children, 49% (148) answered either physician or dentist; i.e. health care professionals. When asked where they got their information on what dose to use only 35% (106) answered physician or dentist, (the majority answered on the medication label.) This is consistent with other studies that have shown the majority of people get their information on OTC medications from their medical provider or clinic.

As part of the health care professional team it is imperative we take more time to educate parents and caregivers on proper medication types and dosage for acute dental pain situations. We may be the front line in protecting the pediatric population and
assuring adequate and safe medication dosages. We must never assume that just because these medications are used by millions of people for at-home pain relief they are well understood and applied appropriately.

*Weaknesses and Difficulties*

Weaknesses of this study include recall bias. Knowing that the doctors caring for their child may be reading their surveys may also have affected responses. Caregivers may have been unwilling, embarrassed or afraid to be truthful in answering questions such as the amount of pain child was in, the time their child was experiencing pain, or the amount of pain medicine given. Caregivers also may overstate pain in order to have immediate treatment. The greatest obstacle to accurate answers may have been nothing more than caregivers’ inability to remember past experiences and what and when medicine was given. On average it took over two weeks to present to the dental clinic. Relying on caregivers’ ability to accurately remember and identify past experiences is always in question. Some of the data we attempted to look at was compromised or not useful due to that inability. We were unable to accurately assess amounts of dosages given and exact dosage schedules due to the fact that caregivers were unreliable in their ability to remember and then restate those amounts. Especially since the time lapse between initial pain and presentation to our dental clinic generally exceeded 2-3 weeks. We are taking into assumption that all answers were as factual and as honest as possible.
Measuring the child’s own perception of pain experienced would have been an interesting data point to include. Comparing the child’s pain perception to the caregivers may have given an insight as to why they used certain medications and dosages. If the children were experiencing different pain levels than the caregivers perceived it definitely would have affected caregivers’ desire and urgency to seek treatment and manage pain.
Conclusions

- The average time spent in pain before seeking definitive treatment was 17.7 days with 45 children experiencing pain for more than 30 days.
- Age was the most significant response variable with over 40% of the categories being clinically significant.
- Younger children were less likely to have received OTC analgesia for dental pain (p=.048)
- The average FACES pain score for the children identified as only being in ‘minimal’ pain was 6.1 out of 10. Most children presented in ‘moderate’ pain (7.2 out of 10, average) and 72 children’s pain score was reported as ‘severe’.
LIST OF REFERENCES


APPENDICES

Appendix (A), Sample of Survey
Management of Acute Dental Pain in Children

Chief Complaint of Pain (check all that apply)  ___Lower Left   ___Lower Right   ___Upper Left    ___Upper Right
Duration of Pain: _____months _____ weeks _____ days
Age of child: ______ y______m
Weight: ______ lbs
Insurance Coverage: _____ None _____Private ______ Public (Medicaid, Caresource, etc.)
Child’s Health History :  ________ Healthy
                      ___________________________ Medical Problems or Disabilities
                      ___________________________ (including Asthma, ADHD etc.)
Mother’s Ethnicity:     ____Caucasian  ____African American  ____Asian American ____Hispanic ____Somali
Number of children in household: _____ 1  _____ 2-3  _____ 4 or more
Maternal Education Level:     ____ Less than High School ____ High School Graduate ___  Some College
                      ___ College Graduate ___ Some Trade School ____ Trade School Graduate

1. Other than for the problem you are here today for, has your child seen a dentist in the past six months?
   _______ Yes
   _______ No

2. How long has this tooth hurt in this most recent episode?
   _________ Less than 1 day
   _________ 1-2 days
   _________ 3-5 days
   _________ More than 5 day

3. Has your child taken any medication for their dental pain in the past 7 days?
   ___ No
   ___ Yes (MARK ALL THAT APPLY)

<table>
<thead>
<tr>
<th>Type/Brand</th>
<th>How Much Each Time</th>
<th>How Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen/Tylenol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ibuprofen/Motrin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orajel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzocaine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Other than for pain, has your child taken any other medication in the past 7 days?
   ____ No
   ____ Yes

<table>
<thead>
<tr>
<th>Type/Brand</th>
<th>How Much Each Time</th>
<th>How Often</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What is the active ingredient in Tylenol?
   _______ Acetaminophen
   _______ Ibuprofen
   _______ Benzocaine
   _______ Aspirin
   _______ don’t know

6. What do you think is the most accurate way to determine the amount of medicine in a single dose for a child under the age of 12?
   _______ Weight and age
   _______ Age
   _______ Weight
   _______ Level of pain
   _______ Don’t know

7. Did your child have any negative reaction or side affect from the over the counter medicine you gave them in the past month?
   ____ Yes (WHAT HAPPENED) ______________________________
   ____ No

8. Do you agree or disagree with this statement:
   “Occasionally giving my child more than the recommended dose will bring relief from dental pain quicker”
   _______ Agree
   _______ Disagree
9. Where did you get the information on which over the counter pain medicine to give your child for the pain they are reporting today?

- Family member
- Pediatrician / physician
- Dentist
- Advertising from TV, newspapers, or magazines
- Pharmacist
- Nurse
- The internet
- OTHER ________________________________

10. Where did you get the information on what dose of over the counter pain medicine to give your child for the pain they are reporting today?

- Family member
- Pediatrician / physician
- Dentist
- Directions on medication bottle
- Pharmacist
- Nurse
- The internet
- OTHER ________________________________

11. Which of the following is closest to your annual household income?

- Less than $25,000
- $25,000 - $49,000
- $50,000 - $74,000
- $75,000 – or more
- Don’t know
- Would rather not answer this question

12. Do you agree or disagree with this statement:
   “Aspirin is an effective pain medication to give my child”

- Agree
- Disagree
- Don’t know
13. Do you think your child needs pain medication that is stronger than over-the-counter for the pain they are reporting today?

_______ Yes
_______ No

14. How would you describe the pain your child is in today?

_______ Minimal
_______ Moderate
_______ Severe

15. Choose the face which represents what you think is the worst pain your child has experienced during this episode, “0” being no pain at all and “10” being the worst pain ever experienced.

No Pain 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50

Worst Pain Ever

16. What is the active ingredient in Motrin?

_______ Acetaminophen
_______ Ibuprofen
_______ Benzocaine
_______ Aspirin
_______ don’t know

17. How did you determine how much over the counter medicine to give your child in the past 7 days?

_______ based on child’s weight
_______ based on child’s age
_______ read directions from bottle
_______ until pain stopped
_______ I just gave it and didn’t know there was a limit

18. Choose the face which represents your child’s pain level after you gave them pain medication.

No Pain 0 2 4 6 8 10

Worst Pain Ever