USE OF ANALEGESICS IN POSTOPERATIVE PAIN CONTROL BY BOARD CERTIFIED PEDIATRIC DENTISTS

Ryan Murphy

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Abstract

Purpose: The purpose of this study is to investigate what post-operative analgesic agents if any, are provided by clinicians for their pediatric dental patients. The study will also evaluate the clinician's philosophy toward pain management in the child patient and look for trends in these philosophies, as well as trends in where they currently practice with regards to pain management and specific analgesic agents.

Methods: An on-line survey (appendix A) was sent to gather data from board certified pediatric dentists. The American Board of Pediatric Dentistry (ABPD) website was used to obtain an e-mail directory of addresses of all registered ABPD members. This e-mail provided them with a link to an online survey site where they could then access the survey. The online survey site used was surveymonkey.com. The survey was available on-line for 3 months. Mantel-Haenszel and chi-square tests were used to check the relationships of hours of patient care, years of experience, and region of the country with other items in the survey.

Results: Responses were received from 210 (27%). The region distribution of the responders was compared to the region distribution of all pediatric dentists. The distributions were found to be similar ($p=0.81$ using a one-sample chi-square test).

Conclusions: Ibuprofen and acetaminophen are recommended most frequently for over the counter (OTC) post-operative pain control by board certified pediatric dentists. Acetaminophen with codeine is prescribed most frequently for post-operative pain control by board certified pediatric dentists. The majority of board certified pediatric dentists adhere to the same philosophies with regard to post-operative pain management as taught in their respective post graduate programs.

Introduction

Pain management is a skill that is needed by the clinician who is providing health care to both children and adults. The traditional theory that pain is directly proportional to the nature and extent of the injury is no longer valid nor accepted amongst health care practitioners. In addition, there is evidence to show that some adults believe that children do not perceive pain as adults do. Lollar[1] found that adults and children differ in their perception of pain and adults consistently underestimate the intensity of children's pain. Haslam[2] indicated that in studying children aged 5 to 18 years old, pain thresholds may be somewhat higher for older children.

Barrett[3] states that pain experience in children is not necessarily a response to tissue damage. Children may experience pain in the absence of tissue injury and are also capable of experiencing multiple types of pain from the same injury because of the plasticity of a child's nocioceptive system. There is evidence that implicates health care providers with their beliefs that children do not feel pain and thus do not need the same therapeutic measures as adults do. Tate[4] stated that many clinicians do not give serious consideration to post-operative pain relief for children because of unfounded beliefs that children do not experience pain to the same degree as adults and children are perceived to bounce back from painful procedures. A qualitative study by Burokas[5] found that 38% of 40 children who had major surgery had sub- therapeutic doses of analgesics prescribed and only 2 children received all the post-operative analgesia that had been prescribed. A study by Swafford and Allan[6] reported that only 26 of 180 pediatric patients in the intensive care unit received narcotics and that no pain medication was given to children

in the recovery room. At the same time 54 injections of pain medication were given to 107 adult patients in the recovery room.

The dental community shows similar evidence of the lack in belief of providing post-operative analgesia to the pediatric patient. In a mail survey of 198 Seattle dentists who treat children, Milgrom et al.[7] found inadequate management of child pain due to the dentist's denial of analgesia. They report 36% of clinicians reported they never provide pain medication in any form for children following tooth extractions.

It is important to all clinicians who are treating the pediatric patient to realize that children do experience post-operative pain. Fung et al.[8] reported that 57% of pediatric patients reported pain within one hour of dental extractions. Acs[9] reported that 37% of children ages 6 to 13 years of age reported post-operative pain after having dental extractions. Acs[10], in a study that examined dental post-operative pain in children found that 31% of children treated reported pain following routine restorative dentistry procedures.

Many modalities have been investigated for those clinicians that do believe that therapeutic analgesia is necessary. McGaw et al. [11] reported in 1987 on the effectiveness of ibuprofen both one and two hours post dental surgery for pain management. This study demonstrated that ibuprofen was statistically superior in terms of post-operative analgesia as compared to acetaminophen elixir and placebo. Pre-operative analgesia has also been studied in children. Primosch [12] reported a comparison of pre-operative ibuprofen, acetaminophen, and a placebo in regards to post-operative pain in children. Both the ibuprofen and acetaminophen were dosed according to age rather than weight. His findings showed that although there was a trend in reduction of post-operative analgesia,

the pre-operative administration of either analgesic was not found to be statistically superior to the placebo administration.

Narcotic analgesia such as opioids have been shown to act on opioid receptors in the central nervous system which result in analgesia, sedation, and cough suppression, but carry the serious drawback of respiratory depression as well as constipation and nausea. Codeine is the standard oral narcotic commonly used in children for moderate to severe pain that is not responsive to acetaminophen or NSAIDs [4]. Moore[13] evaluated the use of post extraction analgesics in children and found that when pain was reported, it was equally well relieved by ibuprofen or acetaminophen with codeine. Acs et al. [10] recommends narcotic medications for the pediatric patient: a combination of codeine and acetaminophen provides the needed relief in the rare cases when acetaminophen and NSAIDs are not sufficient to manage the pain. In cases of severe pain in which codeine and acetaminophen are not effective, meperidine may be indicated. Huynh and Yagiela [14] in their article on current concepts in acute pain management in dentistry reiterate the use of ibuprofen and/ or acetaminophen with codeine and state that pediatric patients rarely require analgesics beyond those obtainable without a prescription.

Cameron and Widmer [15] offer similar information that summarizes the most common post operative analgesic options for the pediatric dental patient. They state the use of paracetamol (acetaminophen) is useful as a pre-operative analgesic that has no effect on post operative bleeding. The uses of non-steroidal anti-inflammatory drugs (NSAIDs) are effective by themselves or in conjunction with paracetamol. They have an opioid sparring effect, but increase bleeding time due to inhibition of platelet aggregation, and thus should be given once hemostasis has occurred. They are contraindicated in

children with bleeding disorders, renal disease, or oncology patients who may have or develop thrombocytopenia. The use of aspirin is not commonly used in dentistry due to the risk of Reye's syndrome; however, aspirin is commonly used in the management of juvenile rheumatoid arthritis. Cameron and Widmer [18] suggest the use of morphine dosed at 0.2-0.3 mg/kg every 4 hours and state there is no risk for addiction in its use for post operative dental pain in children, although it must be administered via intramuscular injection or intravenously. Morphine may cause nausea and constipation, similar to other narcotics, but due to the mode of delivery it is used infrequently for the management of post-operative pain. Finally, the authors conclude that codeine is the most common narcotic medication cited in the literature for use in children when acetaminophen or ibuprofen is not adequate for post-operative dental analgesia. However 10% of Caucasians and up to 30% of Hong Kong Chinese cannot metabolize codeine and thus find it an ineffective analgesic alternative.

The purpose of this study was to examine the current management of dental pain in the pediatric population by board certified pediatric dentists.

Methods

An on-line survey (appendix A) was sent to gather data from board certified pediatric dentists. The American Board of Pediatric Dentistry (ABPD) website was used to obtain an e-mail directory of addresses of all registered ABPD members. There are currently 1,350 diplomates of the ABPD. In a 1980 survey by the Association of Pedodontic Diplomates [16] it was stated that in future studies the practices being used by pedodontists (pediatric dentists) can be determined by polling the Diplomates alone, as an economical and valid alternative to conduction a survey of all Academy (American

Academy of Pediatric Dentistry) members. Following IRB approval from Indiana University, an e-mail was then sent asking these board certified pediatric dentist to participate in the survey. This e-mail included a brief introduction of the investigator and educational institution, the project and the instructions for participating in the survey. The e-mail also informed them that by participating in the survey, they were in turn giving consent to participate in the project and their response would be used as original research data. They were also informed that by participating in the survey, they would not be reimbursed in any fashion. This e-mail provided them with a link to an online survey site where they could then access the questionnaire. The online survey site used was surveymonkey.com. The survey was available on-line for 3 months. The results of the survey were accessible at any time by the registered online user and then downloaded into a spreadsheet format for statistical analysis. Mantel-Haenszel and chi-square tests were used to check the relationships of hours of patient care, years of experience, and region of the country with other items in the survey.

Results

The survey was sent to all board certified pediatric dentists who made their e-mail address available on the membership roster of the ABPD website, 921 in total. Of these, 167 were returned as "undeliverable" for a total number sent of 754. Responses were received from 210 (27%). Of the 210 respondents, 197 (94%) responded that they were currently involved in providing direct patient dental care to children. The remaining 13 respondents were not included in the results. The region distribution of the responders was compared to the region distribution of all pediatric dentists. The distributions were found to be similar ($p=0.81$ using a one-sample chi-square test). While this does not

remove the possibility of response bias, the survey respondents are geographically representative of the entire group.

Hours Worked Per Week

With regard to hours per week the respondents provide direct patient care, 70% responded that they are providing patient care at 25+ hours per week, followed by 18% at 16-25 hours per week, 11% at 6-15 hours per week, and 2% at 1-5 hours per week. When asked if any analgesics are recommended or prescribed to be taken before local anesthetic or pre-surgical medications wear off 31% state they do recommend or prescribe analgesics, while 69% report they do not. There was a statistical significant ($p=0.0008$) correlation with an increase in hours worked by pediatric dentists and the recommendation of analgesics to be taken before anesthesia wears off. Hours per week providing direct patient dental care was not significantly associated with any of the other items. With regard to length in years of providing dental treatment to children, 35% responded they were providing dental treatment for 21-30 years, followed by 32% at 11-20 years, 19% at 30+ years, 12% at 6-10 years and finally 2% at 0-5 years.

Treatment in the Operating Room

In response to the question asking if the dentists surveyed provided dental care for children in an operating room environment under general anesthesia, 77% responded that they did, while 23% responded that they do not. For the 77 % of respondents that state they do provided dental care for children under general anesthesia, 32% state that they never recommend or prescribe post-operative analgesics when IV analgesics have been given under general anesthesia, followed by 25% who state they infrequently do, 24% who state they frequently do and 19% who state they always recommend or prescribe

post-operative analgesics following IV analgesics under general anesthesia. When IV analgesics are not given under general anesthesia, 29% of those who responded state that they never recommend post-operative analgesics, 28% state they infrequently do, 26% state they always do, and 17% state they frequently recommend or prescribe post-operative analgesics following dental care under general anesthesia when no IV analgesics have been given. As the number of years the clinician provided dental treatment for children increased, pediatric dentists were significantly less likely to provide dental care for children in an operating room environment under general anesthesia ($p = 0.0020$) and significantly less likely to recommend or prescribe post-operative analgesics when IV analgesics had been given ($p = 0.0024$).

Pain Philosophy

When asked about the philosophy toward the way that children experience pain, 55% state that children experience pain at the same level that adults do. Of the participants, 32% responded that they believe children experience pain at a lower level than adults do, while 13% responded that children experience pain at a higher level than adults. When asked about the philosophy of pain management and if it is currently the same as was taught in their residency program, 64% responded that their philosophy is the same, while 34% state that their current philosophy of post-operative pain management is different than what they were taught in their post graduate training programs. Pediatric dentists with more years providing dental treatment for children were significantly less likely to use the same pain management philosophy as taught during their post graduate training ($p = 0.0001$).

Over-the-Counter Analgesics

With regard to recommending over-the-counter (OTC) analgesics following a single extraction of a primary tooth, 43% responded that they always do, 29% state that they frequently do, 24% state they infrequently do, and 4% state they never do. In response to recommending OTC analgesics for multiple extractions of primary teeth, 56% state they always do, 25% state they frequently do, 16% state they infrequently do, and 3% state they never do. Those who responded with regard to simple restorative procedures as defined by no direct pulpal involvement of primary teeth, 53% state they infrequently recommend OTC analgesics following a simple restorative procedure, 26% state they never do, 15% state they frequently do and 7% state they always do. With regard to recommending OTC analgesics following invasive restorative procedures as defined by direct pulpal involvement of primary teeth, 41% responded that they infrequently recommend OTC analgesics, 32% state they frequently do, while 16% state they always do and 11% state they never do. With regard to dental trauma of primary teeth, 41% of respondents state they always and frequently recommend OTC analgesics following dental trauma to primary teeth, while 18% state they infrequently do, and 1% state they never do. As years providing dental treatment for children increased, pediatric dentists were significantly less likely to recommend OTC analgesics following single extraction ($p = 0.0005$), significantly less likely to recommend OTC analgesics following multiple extractions ($p = 0.0001$), significantly less likely to recommend OTC analgesics following invasive restorations ($p = 0.0075$), and significantly less likely to recommend OTC analgesics following dental trauma ($p = 0.0004$). Pediatric dentists from different regions were significantly different in recommending OTC analgesics following single

extraction [most frequent in Southwest and West, least frequent in Northwest (p= 0.0156)] , marginally different in recommending OTC analgesics following multiple extractions [least frequent in Northwest and Southeast (p=0.05)], and marginally different in recommending OTC analgesics following dental trauma [least frequent outside the US (p=0.08)].

When asked about their most frequently recommended OTC analgesic for single or multiple tooth extractions, simple or invasive restorative, or trauma, 51% of those who responded state that children's ibuprofen is their first recommendation, while 49% state that children's acetaminophen would be their first recommendation. With regard to a second recommendation of an OTC analgesic, 54% state they recommend ibuprofen, 43% state they recommend acetaminophen and 3% state they would recommend naproxen sodium as a second recommendation for an OTC analgesic. Acetaminophen and Ibuprofen as single agents were both recommended 39% for a third recommendation of an OTC analgesic, while 3% recommend asprin and 1% recommend diphenhydramine as a third recommendation for an OTC analgesic. The majority of those who responded to the survey did not provide dosage that they recommend or stated the dose to be "as directed", or "by weight". Because of this inconsistency in response, this data was omitted from the results.

Prescription Analgesics

With regard to prescribing analgesics following a single extraction of a primary tooth, 53% responded that they never do, 40% state that they infrequently do, 5% state they frequently do, and 2% state they always do. In response to prescribing analgesics for multiple extractions of primary teeth, 48% state they infrequently do, 36% state they

never do, 11% state they frequently do, and 4% state they always do. Those who responded with regard to simple restorative procedures as defined by no direct pulpal involvement of primary teeth, 77% state they never prescribe analgesics following a simple restorative procedure, 21% state they infrequently do, 2% state they frequently do and 1% state they always do. With regard to prescription analgesics following invasive restorative procedures as defined by direct pulpal involvement of primary teeth, 59% responded that they never prescribe analgesics, 35% state they infrequently do, while 4% state they frequently do and 3% state they always do. With regard to dental trauma of primary teeth, 50% of respondents state they infrequently prescribe analgesics following dental trauma to primary teeth, while 31% state they never do, 16% state they frequently do, and 3% state they always do. Pediatric dentists with more years providing dental treatment for children were more likely to prescribe medication following simple restorations ($p = 0.05$) and marginally more likely to prescribe medication following invasive restorations ($p = 0.05$). When asked about their most frequently prescribed analgesic for the above mentioned situations, 96% of those who responded state that acetaminophen with codeine is prescribed, while 4% state that acetaminophen with hydrocodone is their most frequently prescribed analgesic. Of those who responded and gave a second most frequently prescribed analgesic, 73% state that acetaminophen with codeine would be prescribed, 9% prescribe ibuprofen with codeine, 9% prescribe meperidine, and 9% prescribe acetaminophen with hydrocodone.

Discussion

One limitation of this study was the number of "deliverable" e-mail addresses that were listed on the ABPD membership roster, 754 in total. Considering there were

approximately 1350 board certified pediatric dentists at the start of this study, only 55% of them were able to potentially receive the survey. The response rate was 27%, and although this is considered an acceptable response rate and was a geographically diverse distribution, it is only representative of 15% of all board certified pediatric dentists.

Roughly half of the dentists who responded to the survey believe that children and adults experience pain at the same level but nearly one-third responded that children experience pain at a lower level than adults, or stated another way; children have a higher pain tolerance than adults. So why is there such a discrepancy in the beliefs of how children experience pain and if the study is representative of the practice of all pediatric dentists, are one third of the children that are being treated not being offered adequate post-operative pain medication? As the years in practice providing care for children increased, so did the likelihood that these practitioners were not adhering to the philosophies that were taught in their postgraduate programs with regard to post-operative pain management. Combined with this, practitioners with more years experience were also more likely to prescribe medication following an array of different dental procedures, and less likely to recommend OTC analgesics. One could look at this as; if practitioners are not following philosophies that were taught to them in their post graduate work and they are currently prescribing more medication for post-operative pain, then the philosophies taught in the post-graduate programs are similar to the response that children feel pain at a lower level than adults, and thus have a higher pain tolerance As the years in practice increase, practitioners obtain more experience and now find it is necessary to prescribe post-operative analgesics more often for routine intra office dental procedures on primary teeth.

Both over the counter and prescription medication are being offered to our pediatric dental patients for post-operative analgesia. Ibuprofen and acetaminophen were both recommended nearly equal (51% and 49% respectively) as a first choice for an OTC analgesic. When asked about a second choice analgesic other than ibuprofen and acetaminophen, the next most common analgesic recommended was naproxen sodium, but it was only recommended by 3% of the respondents. Ibuprofen and acetaminophen are clearly the most frequent recommended OTC analgesics for children making up nearly 100% of the recommendations by board certified pediatric dentists for post-operative pain management. With regard to prescription medication, acetaminophen with codeine was by far the most commonly prescribed medication making up 96% of the responses. Other prescription medication being provided to children include acetaminophen with hydrocodone, ibuprofen with codeine, and meperidine. This study shows that acetaminophen with codeine is prescribed as a first choice analgesic for post-operative pain control, However 10% of Caucasians and up to 30% of Hong Kong Chinese cannot metabolize codeine and thus find it an ineffective analgesic alternative[18], there may be a lack of awareness of this fact and future studies need to examine this. This may ultimately influence post operative pain management in children. Another limitation of this study was with regard to evaluating the dose of medication, both OTC and prescription.

Future research may look into different prescription medication availability to the pediatric dental patient when the "gold standard" of acetaminophen or ibuprofen is not sufficient and evaluating postgraduate residency programs with their philosophies on post-operative pain in children.

Conclusions:

Based on this study's results, the following conclusions can be made:

1. The majority of board certified pediatric dentists state they believe that children experience pain at the same level that adults do.
2. Ibuprofen and acetaminophen are most frequently recommended most for post-operative pain control by board certified pediatric dentists.
3. When narcotics are selected, acetaminophen with codeine is prescribed most frequently for post-operative pain control by board certified pediatric dentists.
4. The majority of board certified pediatric dentists adhere to the same philosophies with regard to post-operative pain management as taught in their respective post graduate programs.

Appendix A

Questionnaire

1. Are you currently involved providing direct patient dental care to children?

Yes/No

If you answered yes to the above question, how many hours per week are you providing direct patient dental care?

0-5
6-15
16-25
25+

2. Excluding your postgraduate training, how long have you been providing dental treatment for children?
   0-5 years
   5-10 years
   10-20 years
   20-30
   30+ years

3. Do you provide dental care for children in an operating room environment under general anesthesia (GA): **Yes/No**

   How often do you recommend or prescribe post-operative analgesics in the following situations post general anesthesia:

IV analgesics given during GA	**Always**	**Frequently**	**Infrequently**	**Never**
No IV analgesics Given during GA	**Always**	**Frequently**	**Infrequently**	**Never**

4. What is your philosophy toward the way that children experience pain?

   Children experience pain at a higher level than adults do

   Children experience pain the same way that adults do

   Children experience pain at a lower level than adults do

5. How often do you recommend post operative over the counter (OTC) analgesics to your pediatric patients for the following procedures involving primary teeth?

Single Extractions:	**Always**	**Frequently**	**Infrequently**	**Never**
Multiple Extractions:	**Always**	**Frequently**	**Infrequently**	**Never**
Simple Restorative: (no pulpal involvement)	**Always**	**Frequently**	**Infrequently**	**Never**
Invasive Restorative: (direct pulpal involvement)	**Always**	**Frequently**	**Infrequently**	**Never**
Dental Trauma:	**Always**	**Frequently**	**Infrequently**	**Never**

6. Please list in order of frequency the most common (OTC) analgesic you recommend for post-operative pain in your pediatric patients and what dose do you recommend.

1st **Dose:**
2nd **Dose:**
3rd **Dose:**
4th **Dose:**

7. How often do you prescribe prescription medication to your pediatric patients for the following procedures involving primary teeth?

Single Extractions:	**Always**	**Frequently**	**Infrequently**	**Never**
Multiple Extractions:	**Always**	**Frequently**	**Infrequently**	**Never**
Simple Restorative: (no pulpal involvement)	**Always**	**Frequently**	**Infrequently**	**Never**
Invasive Restorative: (direct pulpal involvement)	**Always**	**Frequently**	**Infrequently**	**Never**
Dental Trauma:	**Always**	**Frequently**	**Infrequently**	**Never**

8. Please list in order of frequency the most common prescription medication that you prescribe for post-operative pain in your pediatric patients and what dose you prescribe.

1st **Dose:**
2nd **Dose:**
3rd **Dose:**
4th **Dose:**

9. Do you offer/recommend post operative analgesics to your patients to be taken before pre surgical medications wear off? **Yes/No**

10. With regard to post operative pain management, do you practice the philosophies and offer the same medications that were taught at your post graduate residency program? **Yes/No**

12. In what area of the country do you currently practice?
    West
    Southwest
    Northwest
    Midwest
    East
    Southeast/Northeast

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