

Pediatric Guide to Tonsillectomy and Adenoidectomy

Elma A. Clark BSN, SRNA and Jose Hurtado BSN, SRNA

Project Mentor: Niki Bolin, MSNA CRNA, US Anesthesia Partners

Committee Chair: Sarah Snell, MSNA, CRNA

Adventist University of Health Science Nurse Anesthesia Program

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Abstract

The use of opioids during a tonsillectomy and adenoidectomy (T&A), in the pediatric population, has shown adequate pain management. However, other modalities of analgesia have also shown value in pain control without the unfavorable side effects of narcotics.

Hypoventilation with subsequent hypercarbia, apnea, hypoxia and a significant number of deaths have occurred due to the use of narcotics. The population most likely to require T&A are children with OSA who are at highest risk for morbidity and mortality. ADU SRNA's will participate in the care of pediatric patients undergoing T&As during assigned pediatric specialty rotations occurring at AHS facilities. Therefore, an educational PowerPoint addressing evidence based preoperative, intraoperative, and postoperative pain management techniques for children undergoing a T&A was devised. The aim of this scholarly project was to increase the knowledge base of the ADU SRNA 2019 cohort regarding multimodal pain management techniques for pediatric T&A's. Involvement in the pretesting and posttest assessment was voluntary. For statistical analysis, paired samples t-tests were conducted to analyze the data. Statistical analysis was performed by Roy Lukman, PhD. The mean pre-test score was 60.77 while the mean post-test score was 93.08 with a confidence interval of 95%. The obtained t-test was -5.676 ($p < .001$), which is statistically significant. It can be concluded that the average scores increased significantly.

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Introduction

Tonsillectomy and Adenoidectomy (T&A) is one of the most common surgical procedures performed in the pediatric population. In the United States, an estimated 737,000 patients have undergone tonsillectomies each year (Goldman et al., 2013). Forty years ago, the majority of tonsillectomies performed were indicated for infection. Today, OSA is the most common indication, accounting for over half a million cases a year (Kieran et al., 2013).

T&A's present unique challenges particularly for anesthesia providers. These problems include a shared airway between the anesthesia provider and surgeon, combined with the presence of bloody secretions within the airway itself. As a result, there exists a significantly higher risk of airway complications such as laryngospasm, limited intraoperative access to the patient's airway and other perioperative ventilatory compromises. Traditional pain management techniques that rely heavily on the administration of short and long acting narcotics have resulted in respiratory depression and significant morbidity and mortality.

While postoperative bleeding is the most common complication associated with malpractice claims, anoxia, the absence of oxygen reaching tissue, related to opioids and anesthesia has the greatest overall risk from a monetary standpoint (Sadhasivam, Subramayam, Varughese, & Wilging, 2013). An anoxic event was noted to have the highest monetary award at \$9,017,379, and injuries including anoxia had higher mean monetary awards than death (Mahmoud, Patino, & Sadhasivam, 2013).

The lack of knowledge regarding the intrinsic pathology of T&A along with the use of narcotics for pain control has been found to potentiate obstructive sleep apnea, lead to increase morbidity and mortality. Medication errors and the lack of consistent practices in the

administration of pain medication are also factors in post-tonsillectomy deaths. Implementing evidence based standardized pain management practices would, therefore, promote the quality of care and safety leading to better patient outcomes. (Goldman et al., 2013). Anesthesia providers and surgeons should strive to develop and evaluate ways of identifying children at high risk to determine safe postoperative outcomes. Currently, however, there is no set standard for perioperative pain management for the pediatric T&A patient in either ambulatory or inpatient settings, which has led to respiratory compromise.

Of concern locally, is the absence within the Adventist Health System (AHS) of standardized guidelines for this vulnerable population regarding preoperative screening to identify OSA, intraoperative anesthetic management, postoperative pain management or monitoring for adverse respiratory outcomes. ADU SRNA's will participate in the care of pediatric patients undergoing T&As during assigned pediatric specialty rotations occurring at AHS facilities.

Therefore, two questions, presented in PICO format, assisted in a systematic review of the literature. The first question addressed the clinical problem: In pediatric patients undergoing a tonsillectomy and adenoidectomy (P), how do narcotic medications (I) compare to other modalities of analgesia (C) affect pain management and respiratory depression (O) within the perioperative period (T)? Educational innovation is addressed in the second question: In Adventist University student nurse anesthetists (P), does a 30-minute (T) PowerPoint presentation regarding multimodal pain management approaches for pediatric T&A patients (I) result in an increase in the knowledge base (O)?

Literature Review

Research for the pediatric perioperative management of T&A is limited. Despite the increasing number of tonsillectomies performed, there has been a wide variation in the management of patients, both nationally in the United States, and across the globe. The evidence has tended to point towards increased benefit of using other modalities of analgesia in conjunction with decreased narcotics for prevention of adverse pulmonary complications. Opioid-related respiratory depression has accounted for several deaths and events leading to significant morbidity including anoxic brain injury after adenotonsillectomy in children (Mahmoud, Patino, & Sadhasivam, 2013). As OSA is an exacerbating factor for this population, an apparent need for additional research to define best practices for the management of children with OSA, including safer pain management strategies is evident. According to Cheung et al., (2015), preoperative screening for OSA was suggested to enable anesthesia providers implementing perioperative measures to minimize risks of oxygen desaturation, apnea, or increased work of breathing postoperatively. It is of the highest importance to remain vigilant while providing continuity of care in every stage of the perioperative period.

Pre-Anesthetic Evaluation

Preoperative evaluation in anticipation of adenotonsillectomy should pay particular consideration to the probability and severity of OSA and sleep-disordered breathing (SDB). The ASA practice guidelines for the management of patients with OSA recommend that all adult and pediatric patients with OSA over one year of age should be screened for OSA before undergoing surgery (Cheung et al., 2015). The incidences of perioperative respiratory complications have been proven to be ten times higher for children with OSA compared to those without OSA

(Lauder and Emmott 2014). Thus, the ability to predict which patients are at risk is of utmost importance to direct appropriate perioperative care and postoperative disposition. Caring for a child with OSA has presented pharmacological challenges. Increased perioperative respiratory complications have been attributed to increased opioid sensitivity in patients with hypoxemia. According to Brown (2004), hypoxia has been observed to result in an increased number of pain related mu opioid receptors in children with OSA. This upregulation explained the amplified depressant response to morphine, given for analgesia in this population (Hoffbauer et al., 2015). Hence, children undergoing adenotonsillectomy with a concurrent diagnosis of OSA and severe preoperative intermittent hypoxemia have an increased sensitivity to opioids and decreased postoperative opioid requirements. Assessing the severity of sleep apnea is important as it can predict the risk of postoperative adverse outcomes.

The initial approach to a child with suspected SDB should include a thorough interview that screens for behavioral problems, poor school performance, decreased the quality of life, failure to thrive, and enuresis (Schwengel, 2009). As those factors are often not assessed along with the more common questions regarding snoring, apnea, frequent arousals, morning headaches, and daytime sleepiness.

Although polysomnography (PSG) has proven to be the gold standard for diagnosing OSA and SDB in children, the ability of PSG to predict postoperative respiratory complications has yet to be established in children with OSA (Kieran et al., 2013). Therefore, it would be unnecessary to perform in every case. The American Academy of Otolaryngology's Clinical Practice Guideline recommended PSG in children suffering from symptoms of OSA before T&A if they exhibit medical comorbidities, which include obesity, trisomy 21, craniofacial abnormalities, neuromuscular disorders, sickle cells, and inherited metabolic conditions (Archer

et al., 2010). According to Mahmoud et al., (2013), children with OSA and craniofacial syndromes can quickly obstruct and experience oxyhemoglobin desaturation. Without a tool such as PSG guiding the anesthetic plan, it would be the responsibility of the anesthesia provider to determine the patient's risk of respiratory compromise with expert clinical judgment. The detailed interview of the patient would appropriately be followed by a precise physical assessment which should include: nasal anatomy, ability to breathe through the nose, presence of elongated facies, oral opening size, mandibular size, intermaxillary distance, thyromental distance, tonsillar size, tongue volume, body habitus, and Mallampati score (Schwengel, 2009). The preoperative period can be stressful for children and their parents. The goals of pre-anesthetic medication for children include allaying patient anxiety and facilitating the induction of anesthesia (Akin et al., 2012). Caution must be exercised regarding sedative premedication in children with severe OSA, due to significant airway obstruction and severe oxygen desaturation that can occur. Administration of sedation or anesthesia results in increased airway collapse because of increased closing pressure, loss of pharyngeal muscular tone, and failure of coordination of phasic activation of upper airway muscles with diaphragmatic activity (Mahmoud et al., 2013). The increased opioid sensitivity, coupled with the synergistic effects of sedatives and anesthetics, placed OSA patients at a higher risk of sedation and anesthesia induced respiratory complications and delayed emergence post anesthesia (Schwengel, 2009). Hence, opioid and sedative sparing anesthesia with careful titration of relatively shorter acting anesthetic agents seemed to be warranted during anesthesia for adenotonsillectomy in children with OSA.

After having developed an appropriate plan of action, the anesthesia provider should confirm proper airway management tools including a variety of sizes of face masks, oral airways,

nasopharyngeal airways, tracheal tubes, laryngoscope blades and handles, and laryngeal mask airways are available (Mahmoud et al., 2013). Advanced airway interventions may be necessary to maintain airway patency, oxygenation, and adequate ventilation in any stage of the perioperative period (Archer et al., 2010). Consequently, avoidance of airway complications requires institutional and individual preparedness, careful assessment, proper planning and judgment, excellent communication and teamwork, knowledge and use of a range of techniques and devices, and a willingness to stop performing procedures when they are failing.

Intraoperative Anesthetic Management

Adenotonsillectomy is a painful procedure requiring adequate analgesia. For pain control, a narcotic administration has proven useful and became the preferred method of analgesia in the perioperative period. Complications from opioids, such as oversedation and respiratory depression are unwanted but commonly seen. (Tekelioglu et al. 2013). Children with significant OSA presented an increased anesthetic risk in the perioperative period, more so than patients with normal upper airways (Heitmiller et al., 2009). Avoiding opioids, or at least reducing the dose, should be standard practice in adenotonsillectomy patients exhibiting respiratory comorbidities. Therefore, better perioperative risk reduction strategies and monitoring of high-risk pediatric patients are important in avoiding serious complication during a pediatric tonsillectomy.

The differing metabolism of narcotics by pediatric patients, especially those with OSA, make it difficult to determine what, when, and how much medication to give for pain. In 2012, a black-box warning against codeine-containing medications in children undergoing tonsillectomy was issued by the Food and Drug Administration (FDA) due to reported deaths in this setting caused by sleep-disordered breathing (Greenberg et al., 2014). Codeine has been found directly

responsible for multiple pediatric deaths (Wolfe et al. 2016). Other opioid options have included morphine, which appears adequate for intraoperative pain control when used in the recommended dose. Morphine has become the standard against which all other forms of analgesia are measured (Lauder & Emmott 2014). Due to the upregulation of pain receptors discussed previously, there is reduced morphine requirement for children presenting hypoxemia associated with OSA (Brown et al., 2004). Hydromorphone has fewer side effects than morphine theoretically, yet has not replaced morphine as the opioid of choice due to the disparity in potency; it is 8-10x more potent than morphine and has led to clinicians underestimating its respiratory depressant effects (Wolfe et al. 2016).

There has been a great effort to convert anesthesia providers to using other modalities of analgesia in conjunction with narcotics to decrease use of opioids, therefore, reducing respiratory compromise in the pediatric population. In practice, anesthesia providers avoided non-steroidal anti-inflammatory drugs (NSAIDs) in children undergoing T&A due to increased risk of postoperative bleeding (Greenberg, Mattos, Robison, & Yellon, 2014). However, it has been proven that the risk of bleeding observed in adult patients taking NSAIDs is significantly lower in children following a tonsillectomy (Hoffbauer et al., 2015). Pharmacological options open the possibility of different drug combinations to help control the pain in patients undergoing an adenotonsillectomy while avoiding oversedation. Non-opioids such as the NSAIDs ketorolac and ibuprofen, acetaminophen, dexamethasone, and dexmedetomidine became subjects of study to decrease usage of opioids. The premise with multimodal analgesia was to reduce opioid consumption, to lessen adverse events, nevertheless provide adequate pain control. The potential to improve efficiency with multi-modal analgesia is advocated for management of pediatric perioperative pain by concurrently targeting different analgesic mechanisms and reducing the

dose requirements of single agents, therefore, minimizing dose-dependent adverse effects (St. John-Green, St John-Green, & Wong, 2013). It is important for the anesthesia provider to determine what combination of analgesic medications will best work to avoid respiratory complications. One proposed recommendation from the above list of medications is dexmedetomidine. An alpha-2 agonist, this drug has analgesic properties that cause sedation without respiratory compromise and does not affect coagulation (Diefenderfer et al., 2010). When administered intraoperatively, dexmedetomidine has proven to decrease the opioid requirement used in the postoperative period. There is no current evidence to recommend any particular anesthetic technique for children with OSA (Sadhasivam et al., 2013). However, all the available non-narcotic options served as tools for the provider to enhance pain management.

Postoperative Care

The role of narcotics in postoperative analgesia following a tonsillectomy remains unclear. Residual effects of anesthetics and opioids administered can manifest in the postoperative period as apnea, hypopnea, desaturation, and hypercarbia (Sadhasivam et al., 2013). OSA is a clear risk factor for postoperative respiratory complications; as the severity of nocturnal hypoxemia rises, the incidence of pulmonary complications increases (Goldman, 2013). While the postoperative pain in children with OSA needs to be controlled to promote a smooth recovery process, these patients run the risk of their chronic hypoxemia rendering them more susceptible to the respiratory depressant effects of opioids. Currently, no evidence demonstrates any immediate improvement in ventilation after surgery, suggesting that any respiratory issues that existed before the surgery will still require an undetermined amount of time to correct themselves. Frequently, postoperative airway edema, along with increased sensitivity to the respiratory-depressant effects of opioids, may result in obstructive symptoms

and hypoxemia (Diefenderfer et al., 2010). As the care provider role switches from the anesthesia team to the post anesthesia care unit (PACU) team, understanding of the sedative effects of analgesics and airway management is required to provide safe continuity of care. Traditionally the focus on reducing postoperative morbidity and mortality has been whether the patient should be admitted to the hospital for monitoring overnight. The onset of respiratory compromise following a tonsillectomy has been found to occur less than 15 hours after having the procedure. However, the standard for tonsillectomy and adenoidectomy has shifted to making it mainly an ambulatory procedure with patients being sent home within 24 hours of surgery (Brown et al., 2004). At which point, the care of the patient shifts again, landing on the parent or guardian to determine how much narcotic the patient needs vs. how much he or she has had already. There is increased concern for postoperative respiratory complications that may necessitate intubation and other major interventions, which are only immediately available in the hospital setting (Kieran et al., 2013). Baugh (2014) recommends clinicians and care takers set realistic goals as eliminating pain altogether would very likely lead to respiratory depression, and believes the control of pain, not its elimination, should be the objective. The greater number of tonsillectomies performed in the United States may account for the current recognition of this problem; therefore, further research is needed to determine best practices for perioperative care, hospital admission criteria, and pain management.

Contribution and Dissemination/Justification

There exists a lack of knowledge regarding multimodal pain management techniques for pediatric T&A's and the potential risk of respiratory depression and complications. This project was aimed to increase the knowledge base of ADU SRNA's with the development and

implementation of an educational PowerPoint presented in the spring of 2018 to the 2019 ADU SRNA cohort. Results of this scholarly project will be disseminated during the ADU NAP Scholarship/Poster Presentation Day, tentatively scheduled for April 9, 2018, from 1:00-3:00 PM.

Project Aims

The primary aim of this scholarly project was to increase the knowledge base of the 2019 ADU SRNA cohort regarding multimodal pain management techniques as well as the risk for respiratory depression in pediatric patients undergoing T&A's. This will have been demonstrated by statistically significant improvements in test scores as compared to baseline pretest scores.

Project Methods

This scholarly project had a quantitative pre/post-test design. A convenience sample of 26 SRNAs from the 2019 cohort had been selected. Inclusion criteria included any students making part of the class of 2019 of the NAP at ADU. An educational PowerPoint was developed to contain the latest evidence-based recommendations regarding perioperative anesthetic management and the potential for respiratory depression and subsequent morbidity and mortality of the pediatric T&A patient. All tests administered, as well as collected data, were de-identified. No identifying information was requested or included on the tests. The subjects took a post-test following the lecture that. Pretest and post-test were numerically matched for statistical comparison. The data was entered into Microsoft Excel using a basic spreadsheet and sent to Roy Lukman PhD for statistical analysis using SPSS. Information was stored and protected with a password in the scholarly project team member's personal laptop. Immediately after dissemination, all pre and post tests will be shredded and all data deleted off from the

computer. Only four people will have access to the collected data; these individuals include the scholarly project team members, the committee chair, and the statistician.

Timeline

The predicted timeline for this scholarly project begins with the literature review about this topic concluded on June 30, 2017, when the project proposal is due. Scholarly project paper development ensued from May to July 17, 2017. The completed online ADU CITI modules certificate were submitted on May 31, 2017. Preparation for the SRC/IRB application forms was completed June 30, 2017. Pre/post-test and power point presentation were completed by December 31, 2017. Finally, the implementation/presentation phase was carried out on January 18, 2018 by presenting the topic to the 2019 NAP cohort and administration of the pre/post-test. Results of this scholarly project will be disseminated during the ADU NAP Scholarship/Poster Presentation Day, scheduled for April 9, 2018, from 12:00-2:30 PM.

Data Collection

Data was collected using a pretest and a post-test immediately following the PowerPoint presentation. Upon explanation of the scholarly project, all individuals participating signed an informed consent to verify that they are willing participants in the study. The subjects' baseline knowledge of the topic was then tested before implementing the PowerPoint presentation. The data collected from pre and post-test was then entered into a Microsoft Excel sheet and submitted to Roy Lukman Ph.D. for statistical analysis.

Evaluation

The posttest, a replica of the pretest, was administered immediately following the PowerPoint presentation during the MSNA 502 Clinical Conference II course on January 18, 2018. It was the project aim that upon presenting the lecture on the pediatric guide to T&A, the

knowledge base of the NAP cohort of 2019 would demonstrate an increased knowledge base on the topic. For statistical analysis, paired samples t-tests were conducted to analyze the data. Statistical analysis was performed by Roy Lukman, PhD. The mean pre-test score was 60.77 (SD=29.51) with a mean post-test score of 93.08 (SD=9.28). The obtained t-test results indicated a significant increase in student knowledge base between pre and post tests ($t(25) = -5.68$, $p < .001$).

Limitations

Limitations for the scholarly project include the relatively small sampling size of 26 SRNAs. This was a homogenous sample due to the inclusion criteria calling for only those students who are enrolled in the Nurse Anesthesia Program class of 2019. Lastly, post test was administered immediately after the lecture which tested knowledge base but not information retention.

Conclusions

Through conduction of the literature review, it was concluded that all though opioid use to treat pain, related to tonsillectomy and adenoidectomy, is not inherently an unsafe practice, it does put the pediatric patients receiving them at an increased risk of adverse respiratory events. The literature revealed multiple pharmacological approaches that have proven effective in attenuating these risks by reducing opioid requirement and use in these cases. The risk of a patient suffering an adverse respiratory effect can never be eliminated, only reduced, which was pointed out in the literature to emphasize the importance of developing adequate knowledge of the airway anatomy for this population and developing an expertise in their airway management.

Using the power point presentation to lecture on a pediatric guide to tonsillectomy and

adenoidectomy, it was concluded the knowledge of the subjects taking the test increased substantially from baseline. This demonstrates a potential positive impact that a power point lecture can have in the development of the nurse anesthesia students made evident by the increased test score average. There is no metric that will show how much retention of the knowledge attained will remain over time or if any of the knowledge learned will be implemented in practice. The researchers can only hope that the information presented will motivate each individual to methodically plan their patients' anesthesia at the highest level of their scope of practice.

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Appendix A

Pre/Post-Test Key

1. Physiologically, what is to blame for the increased opioid sensitivity in OSA patients?
 - a. Mu receptor upregulation**
 - b. Mu receptor downregulation
 - c. Alpha receptor up regulation
 - d. Alpha receptor downregulation
2. How much more potent is Hydromorphone than morphine?
 - a. 2-4x
 - b. 8-10x**
 - c. 10-20x
 - d. 80-100x
3. Which of the following is an example of a non-opioid analgesic?
 - a. Ketorolac
 - b. Dexamethasone
 - c. Dexmedetomidine
 - d. Acetaminophen
 - e. All the above**
 - f. None of the above
4. Which sedative can provide some analgesia, making it a good candidate for multimodal analgesia?
 - a. Propofol
 - b. Precedex**
 - c. Thiopental
 - d. Sevoflurane
5. What is the premise with multimodal pain management?
 - a. Provide pain relief, Increase opioid consumption, lessen adverse events
 - b. Provide pain relief, decrease opioid consumption, lessen adverse events.**
 - c. Provide pain relief, decrease opioid consumption, increase revenue for provider
 - d. None of the above.
6. Residual effects of anesthetics and opioids administered can manifest in the postoperative period as:
 - a. apnea
 - b. hypoapnea
 - c. desaturation
 - d. hypercarbia
 - e. All of the above**

7. Clinicians and caretakers should set realistic goals, as eliminating pain completely would very likely lead to respiratory depression, and control of pain, not its elimination, should be the objective.
- a. True**
 - b. False
8. Postoperative airway edema, along with increased sensitivity to the respiratory-depressant effects of opioids, may result in:
- a. obstructive symptoms
 - b. hypoxemia
 - c. bradycardia
 - d. a & b**
 - e. None of the above
9. Anesthesia providers avoided non-steroidal anti-inflammatory drugs (NSAIDs) in children undergoing T&A due to increased risk of post-operative bleeding.
- a. False
 - b. True**
10. Multi-modal analgesia is advocated for management of pediatric perioperative pain by concurrently targeting different analgesic mechanisms and reducing the dose requirements of single agents, therefore, minimizing dose-dependent adverse effects.
- a. True**
 - b. False

Appendix B

ADU NAP CAPSTONE PROJECT – INFORMED CONSENT

Our names are Elma A. Clark and Jose Hurtado, and we are MSNA students in the Nurse Anesthesia Program (NAP) at Adventist University of Health Sciences (ADU). We are doing a Capstone Project called *Pediatric Guide to Tonsillectomy and Adenoidectomy*. This project is being supervised by Sarah Snell, MSNA, CRNA. We would like to invite you to participate in this project. The main purpose of this form is to provide information about the project so you can make a decision about whether you want to participate.

WHAT IS THE PROJECT ABOUT?

The purpose of this project is to increase the knowledge base of the 2019 ADU SRNA cohort regarding multimodal pain management techniques as well as the risk for respiratory depression in pediatric patients undergoing T&A's.

WHAT DOES PARTICIPATION IN THIS PROJECT INVOLVE?

If you decide to participate in this project, you will be asked to complete an anonymous pre-assessment, attend a classroom presentation, and then complete an anonymous post-assessment. The assessment will address student's knowledge regarding multimodal pain management techniques for pediatric T&A's and the potential risk of respiratory depression and complications. Your participation by attendance at the presentation and completion of the survey is anticipated to take approximately 1 hour.

WHY ARE YOU BEING ASKED TO PARTICIPATE?

You have been invited to participate as part of a convenience sample of students currently enrolled in the ADU NAP. Participation in this project is voluntary. If you choose not to participate or to withdraw from the project, you may do so at any time.

WHAT ARE THE RISKS INVOLVED IN THIS PROJECT?

Although no project is completely risk-free, we don't anticipate that you will be harmed or distressed by participating in this project.

ARE THERE ANY BENEFITS TO PARTICIPATION?

We don't expect any direct benefits to you from participation in this project. The possible indirect benefit of participation in the project is the opportunity to gain additional knowledge about multimodal pain management techniques for pediatric T&A's and the potential risk of respiratory depression, and complications.

HOW WILL THE INVESTIGATORS PROTECT PARTICIPANTS' CONFIDENTIALITY?

The results of the project will be public shed, but your name or identity will not be revealed. To maintain confidentiality of assessments, the investigators will conduct this project in such a way to ensure that information is submitted without participants' identification. No names will appear on the paper and each paper will be numbered for evaluation only. Thus, the investigators will not have access to any participants' identities.

WILL IT COST ANYTHING OR WILL I GET PAID TO PARTICIPATE IN THE PROJECT?

Your participation will cost approximately one hour of your time, but will require no monetary cost on your part. You will not be paid to participate.

VOLUNTARY CONSENT

By signing this form, you are saying that you have read this form, you understand the risks and benefits of this project, and you know what you are being asked to do. The investigators will be happy to answer any questions you have about the project. If you have any questions, please feel free to contact Elma A. Clark (el.aseron.patterson@my.adu.edu) and Jose Hurtado (jose.hurtado@my.adu.edu). If you have concerns about the project process or the investigators, please contact the Nurse Anesthesia Program at (407) 303-9331.

Date _____

Participant Signature/ Participant Name (PRINTED LEGIBLY)

Participant Name (PRINTED LEGIBLY)

Appendix C Analysis Charts

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	60.7692	26	29.51922	5.78920
	Post-Test	93.0769	26	9.28191	1.82033

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Pre-Test - Post-Test	-32.30769	29.02519	5.69231	-44.03122	-20.58417	-5.676	25	.000

Appendix D

Power Point Presentation

2/26/18

Pediatric Guide to Tonsillectomy and Adenoidectomy

ELMA CLARK, BSN, SRNA & JOSE HURTADO, BSN, SRNA
PROJECT MENTOR: NIKI BOLIN, MSNA, CRNA, US ANESTHESIA PARTNERS
COMMITTEE CHAIR: SARAH SNELL, DNP, CRNA

Objectives

- Familiarization with the tonsillectomy and adenoidectomy (T&A) procedure according to current literature
- Learn to identify the risks involved in taking care of pediatric T&A patient
- Identify which subpopulation is at higher risk
- Learn about the special considerations when managing a pediatric airway
- Understand the effects that OSA has on narcotic tolerance.
- Review current literature supporting narcotic use and multimodal pain management techniques for pediatric T&A

Case Scenario

- Pediatric rotation of an SRNA
- 3 year old male for T&A, first patient of the day
- Inhalational induction lead to patient going apneic, mask ventilation was difficult, but possible
- DL view was impaired by enlarged tonsils. Intubated x1 attempt
- Typical morphine dose for post op pain: 0.1mg/kg
- Uneventful surgical procedure, patient discharged 4 hours later then expected.
- Sent home with prescription children's ibuprofen as only mode of analgesia.

Introduction to T & A

- T&A is the most common surgical procedure performed in the pediatric population. Around 737,000 performed a year (Baugh et al., 2013)
- Painful procedure requiring adequate pain control. Narcotic administration is the preferred method of analgesia in the perioperative period. Unwanted complications from opioids, such as over sedation and respiratory depression are unwanted but commonly seen. (Tekeloglu et al. 2013)
- Main reason for : OSA leading to sleep disordered breathing accounting for over 500.00 of cases (Kieran et al., 2013)
- Children with significant OSA are at increased anesthetic risk in the perioperative period than patients with normal upper airway (Heilmüller et al., 2009).
- OSA IS A MAJOR FACTOR WHEN DETERMINING ANESTHETIC PLAN

Pediatric Airway (Naglehout)

- Not just little adults!
- In general, infants have a large tongue and cranium in relation to small mandible and maxilla → Increased risk of airway obstruction.
- Chest wall more compliant than adults → Collapsible with inspiratory effort/expiratory expiration. (P. 1261)

TABLE 47-3 Differences Between the Adult Airway and the Pediatric Airway

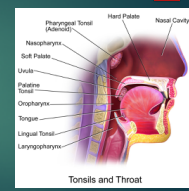
	Pediatric	Adult
Laryngeal location	C2-C4	C3-C6
Narrowest location of airway	Cricoid	Glottis
Shape of epiglottis	Longer, more narrow	V-shaped
Right mainstem bronchus	Less vertical	More vertical

P. 1166

• Children younger than 10 years narrowest part is just below the vocal cords at the cricoid cartilage
→ clinical significance: a tube can catch the VCs may create mucosal pressure at the level of the cricoid ring. For this reason, traditionally, uncuffed endotracheal tubes have been used in children less than 8 to 10 years of age * (P. 591)

Tonsils and Adenoids (Pharyngeal tonsil)

- Tonsils are the simplest lymphoid organs
- Named according to their location, to form what is known as Waldeyer's tonsillar ring (Palatine, lingual, pharyngeal, tubal)
- Appear as swellings of mucosa that gather and remove pathogens entering the pharynx through food or inhaled air.
- Calculated risk inviting pathogens to create memory mediated immunity and destroy them.
- Process can often lead to infection.



<http://humananatomybykey.com/anatomy-of-a-tonsil/>

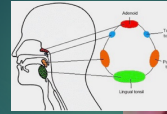
2/26/18

Tonsils and Adenoids

Tissue	Epithelium	capsule	Crypts	Location
Adenoids	Columnar	Complete	No crypts, but small folds	Roof of pharynx
Tonsil tonsils	Columnar	Incomplete	No crypts, but small folds	Roof of pharynx
Palatine tonsils	Columnar	Incomplete	No crypts, but small folds	Roof of pharynx
Palatine tonsils	Non-keratinized stratified squamous	Incomplete	Long, branched crypts	Sides of pharynx between palatine tonsil and palatopharyngeal arches
Uvular tonsils	Non-keratinized stratified squamous	Incomplete	Long, branched crypts	Anterior terminal (velum linguae)

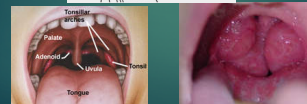
<http://humananatomylibrary.com/anatomy-of-a-tonsil/>

Tonsils and Adenoids



Waldeyers Ring

<http://www.outlandanatomy.com/tag/tonsils/>



<http://humananatomylibrary.com/anatomy-of-a-tonsil/> <http://www.entusa.com>

T&A's Unique Challenges For Anesthesia Providers!

- Shared airway between the anesthesia provider and surgeon.
- Presence of bloody secretions within the airway itself.
- Significantly higher risk of airway complications such as laryngospasm, limited intraoperative access to the patient's airway and, perioperative ventilatory compromises.
- Traditional pain management techniques that rely heavily on the administration of short and long acting narcotics have resulted in respiratory depression and significant morbidity and mortality.

Legal Implications



Legal Implications

- Postoperative bleeding is the most common complication associated with malpractice. However, anoxia related to opioids and anesthesia has the greatest overall risk from a monetary standpoint (Sadhaviam, Subramayam, Varughese, & Wilging, 2013).
- An anoxic event was noted to have the highest monetary award at \$9,017,379 and injuries including anoxia had higher mean monetary awards than death (Mahmoud, Palino, & Sachdeviam, 2013).



Lack of Knowledge

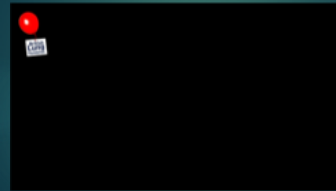
- The lack of knowledge regarding the intrinsic pathology of T&A along with the use of narcotics for pain control has been found to potentiate obstructive sleep apnea, that lead to increase morbidity and mortality.
- Medication errors and the lack of consistent practices in the administration of pain medication are also factors in post-tonsillectomy deaths.
- Implementing evidence based standardized pain management practices would, therefore, promote the quality of care and safety leading to better patient outcomes. (Goldman et al., 2013).

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LACK OF SET GUIDELINES FOR ANESTHESIA PROVIDERS

- ▶ Anesthesia providers and surgeons should strive to develop and evaluate ways of identifying children at high risk to determine safe postoperative outcomes.
- ▶ Currently, however, there is no set standard for perioperative pain management for the pediatric T&A patient in either ambulatory or inpatient settings, which has led to respiratory compromise.
- ▶ Of concern locally, is the absence within the Adventist Health System (AHS) of standardized guidelines for this vulnerable population regarding preoperative screening to identify OSA, intraoperative anesthetic management, postoperative pain management or monitoring for adverse respiratory outcomes.

Preoperative Evaluation



▶ Video provided by the British lung institute.

Preoperative Evaluation

- ▶ The ASA practice guidelines for the management of patients with OSA recommend patients over 1 year of age should be screened for OSA prior to undergoing surgery (Cheung et al., 2013).
- ▶ Polysomnography (PSG) is the gold standard for assessing and gauging severity of OSA.
- ▶ The American Academy of Otolaryngology's Clinical Practice Guideline recommends PSG in children suffering from symptoms of OSA prior to T&A if medical comorbidities exhibited (obesity, laryngomy 2), craniofacial abnormalities, neuromuscular disorders, sickle cells, and inherited metabolic conditions (Kieran et al., 2013).
- ▶ In common practice, PSG not readily available or incorporated in care. It is unnecessary to perform in every case and does not establish the effects of sleep disordered breathing (SDB) on the child's well being.

Preoperative Evaluation

- Apnea Hypopnea Index (AHI)**
- ▶ The AHI is the number of apneas or hypopneas recorded during the study per hour of sleep. It is generally expressed as the number of events per hour, based on the AHI, the severity of OSA is classified as follows:
 - None/Mild: AHI < 5 per hour
 - Mild: AHI ≥ 5, but < 15 per hour
 - Moderate: AHI ≥ 15, but < 30 per hour
 - Severe: AHI ≥ 30 per hour
 - ▶ Sometimes the Respiratory Disturbance Index (RDI) is used. This can be confusing because the RDI includes not only apneas and hypopneas, but may also include other, more subtle, breathing irregularities. This means a person's RDI can be higher than his or her AHI.
- Oxygen Desaturation**
- ▶ Reductions in blood oxygen levels (desaturation) are recorded during polysomnography or limited channel monitoring. At sea level, a normal blood oxygen level (saturation) is usually 96 - 97%. Although there are no generally accepted classifications for severity of oxygen desaturation, reductions to not less than 90% usually are considered mild. Dips into the 80 - 89% range can be considered moderate, and those below 80% are severe.

Preoperative Evaluation

- ▶ Special consideration when assessing the probability and severity of OSA is required. The incidences of peri-operative respiratory complications are 10 times higher for children with OSA compared to those without OSA (Lauder and Emmott, 2014).
- ▶ According to Schwengel (2009) the initial approach to a child with suspected sleep disordered breathing should include assessment of:
 - Behavioral problems,
 - Poor school performance
 - Decreased quality of life
 - Failure to thrive
 - Enuresis
 - Standard airway assessment
 - Nasal anatomy
 - Ability to breath through nose
 - Tonsillar size

▶ "I'm Sleepy" questionnaire

Table 1. Pediatric Obstructive Sleep Apnea Screening "I'M SLEEPY" Questionnaire (Parent Version)*


1. Is your child often restless or angry during the day?	(1/No) (0/Yes)
2. Body mass index (BMI)?	(1/No) (0/Yes)
3. Does your child snore at night?	(1/No) (0/Yes)
4. Does your child sometimes have labored breathing at night?	(1/No) (0/Yes)
5. Does your child have enlarged tonsils and/or adenoids?	(1/No) (0/Yes)
6. Does your child have problems with swallowing or eating?	(1/No) (0/Yes)
7. Does your child often wake up or is he or she often tired during the day?	(1/No) (0/Yes)

*Score of 0 to 7 indicates a low risk of obstructive sleep apnea (OSA). High risk is indicated by a score of 8 to 10. Sensitivity, 80%; specificity, 90%; negative predictive value, 90%. This questionnaire has not yet been validated in larger studies. From Ref. 19.

Wolfe et al. 2016

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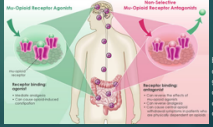
Anesthetic Plan



Decrease use of opioid!

Anesthetic Plan

- Perioperative complications are due in part to an increased response to opioids from OSA patients.
- Continuous hypoxia, induces increased number of pain related mu opioid receptors in children with severe OSA that explains the heightened sensitivity to postoperative morphine given for analgesia (Brown 2004)



<https://www.opiate.com/a/guest/first-ol-opioid-agonist-drug/>

Anesthetic Plan

- Morphine has become the standard against which all other forms of analgesia are measured (Lauder & Emmott 2014).
- Due to the upregulation of pain receptors, morphine requirement for children with OSA is reduced (Brown et al., 2004)
- Theoretically, Hydromorphone has fewer side effects than morphine, but 8-10x more potent. It has led clinicians to underestimate its respiratory depressant effects (Wolfe et al 2014).
- In the past, Codeine was the analgesic of choice for post op pain control. But has been found directly responsible for multiple pediatric deaths (Wolfe et al 2014)
- In 2012 a black-box warning against codeine-containing medications in children undergoing tonsillectomy was issued by the Food and Drug Administration (FDA) (Greenberg et al., 2014)

Anesthetic Plan

- There has been a great effort to convert anesthesia providers to using multimodal approach decrease use of opioids
- Use of Non-opioids such as acetaminophen, ketorolac, dexamethasone, ibuprofen and dexmedetomidine became subjects of study.
- The premise is targeting different analgesic mechanisms and reducing the dose requirements of single agents, therefore, minimizing dose-dependent adverse effects.
- In practice, anesthesia providers avoid non-steroidal anti-inflammatory drugs (NSAIDs) in children undergoing T&A due to increased risk of post-operative bleeding (Greenberg, Mattos, Robison, & Yellon, 2014).

Anesthetic Plan

- Preparedness is Key
- Anticipate difficult mask ventilation and/or difficult intubation due to large tonsils and decreased pharyngeal space.
- Airway management tools available...and know how to use them!
 - Variety of sizes of facemasks, oral airways, nasopharyngeal airways, laryngeal tubes, laryngoscope blades and handles, and laryngeal mask airways
- Careful when in the airway!!!
 - Oral airway is preferred. Nasal can cause trauma to the hypertrophied adenoid tissue → risk bleeding
 - Introducing and manipulating an oral airway and laryngoscope blade can inadvertently cause trauma to the enlarged tonsils → bleeding
- ET: Wire Reinforced vs. Oral RAE vs regular tube. (Surgeon preference)

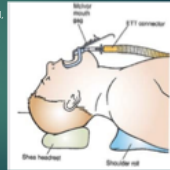
Anesthetic Plan

- REMEMBER: Advanced airway interventions may be necessary to maintain airway patency, oxygenation and adequate ventilation.
- Avoidance of airway complications require:
 - institutional and individual preparedness
 - careful assessment
 - good planning and judgment
 - good communication and teamwork
 - knowledge and use of a range of techniques and devices
 - willingness to stop performing techniques when they are failing.
- Premedication is pre: Midazolam 0.5-0.7 mg/kg PO. Some clinician advocate avoiding in children with OSA. (Mallinroud et al 2013)
- Schwengel (2009) states that sedation resembles natural sleep, with increased airway collapse as a result of increased closing pressure, loss of pharyngeal muscular tone, and failure to coordinate phasic activation of upper airway muscles with diaphragmatic activity (note video example from the British lung institute)
- Antisialogogue recommended. Typically Robinul 0.01mg/kg once IV access has been obtained.

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Tonsillectomy and Adenoidectomy

- ▶ Inhalational induction. Typically up to 16 y/o with fear of needles (Nagthout p. 1200)
- ▶ Position: "Rose position" supine, shoulder roll, head extended. Table turned 90-180 degrees.
- ▶ Mouth gag (McKoy) is inserted and secured to the mayo stand.
 - Can be very stimulating. Can occlude ETT.
 - Ensure adequate anesthesia for this part, verify ETT position and patency before and after mouth gag positioning/repositioning
- ▶ NMB are ok to use. (Moving, coughing and swallowing are contraindicated)



Anesthesiologist's Manual of Surgical Procedures

Tonsillectomy and Adenoidectomy

- ▶ Usually, a throat pack is used.
- ▶ Adenoids are removed first with a curette, and the nasopharynx packed.
- ▶ Tonsillectomy: grasping the upper pole of tonsil and drawing it medial allows a mucosal incision to be made over the anterior faucial pillar.
- ▶ Tonsil is dissected from its bed and removed. A snare may be used to snip the dissected tonsil off at the lower pole.
- ▶ Hemostasis is secured with gauze packs and the use of electrocautery
- ▶ Removal of throat and nasal packs verified before extubating
- ▶ Gastric suctioning of swallowed secretions and blood reduces risk of PONV
- ▶ Be attentive to laryngospasm/bronchospasm. Consider deep extubation
- ▶ Postoperative airway edema along with bleeding may result in obstructive symptoms and hypoxemia (Diefenderfer et al., 2010).



www.postcare.com

Tonsillectomy and Adenoidectomy

- ▶ Residual effects of anesthetics and opioids administered can manifest in the postoperative period as apnea and hypopnea, leading to hypoxemia and hypercarbia.
- ▶ Any respiratory issues that existed before the surgery will persist in the post op period
- ▶ Baugh (2014) recommends clinicians and care takers set realistic goals. As eliminating pain completely would very likely lead to respiratory depression and believes the control of pain, not its elimination should be the objective.

Postoperative Care



You're gonna end up eatin' a steady diet of popsicles and livin' in a recliner down by the television!!!!

Postoperative Care

- ▶ There is little to no immediate improvement in ventilation after surgery, suggesting that any respiratory issues that existed before the surgery will still require an undetermined amount of time to correct themselves.
- ▶ Frequently, postoperative airway edema, along with increased sensitivity to the respiratory-depressant effects of opioids, may result in obstructive symptoms and hypoxemia (Diefenderfer et al., 2010).

Postoperative Care

- ▶ Residual effects of anesthetics and opioids administered can manifest in the postoperative period as apnea, hypopnea, desaturation, and hypercarbia (Sachdevam et al., 2013).
- ▶ As the care provider role switches from the anesthesia team to the post anesthesia care unit (PACU) team, understanding of the sedative effects of analgesics and airway management is required to provide safe continuity of care.

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Postoperative Care

- ▶ Traditionally the focus on reducing postoperative morbidity and mortality has been whether the patient should be admitted to the hospital for monitoring overnight.
- ▶ The onset of respiratory compromise following a tonsillectomy has been found to occur less than 15 hours after having the procedure.
- ▶ However, the standard for tonsillectomy and adenoidectomy has shifted to making it mainly an ambulatory procedure with patients being sent home within 24 hours of surgery (Brown et al., 2004).

Postoperative Care

- ▶ The care of the patient shifts again, landing on the parent or guardian to determine how much narcotic the patient needs vs. how much he or she has had already.
- ▶ There is increased concern for postoperative respiratory complications that may necessitate intubation and other major interventions, which are only immediately available in the hospital setting (Kieran et al., 2013).

Postoperative Care

- ▶ Baugh (2014) recommends clinicians and care takers set realistic goals as eliminating pain altogether would very likely lead to respiratory depression, and believes the control of pain, not its elimination, should be the objective.
- ▶ The greater number of tonsillectomies performed in the United States may account for the current recognition of this problem; therefore, further research is needed to determine best practices for perioperative care, hospital admission criteria, and pain management.

Review of Literature



Baugh, R. F., Bereton, J., Brenner, M. J., Davies, L., Eisenberg, L. D., Goldman, J. L., ... Stachler, R. J. (2013). Mortality and major morbidity after tonsillectomy: Etiologic factors and strategies for prevention. *The Laryngoscope*, 123, 2544-2553. <http://dx.doi.org/10.1002/lary.23926>

- ▶ **Objectives:** To report data on death or permanent disability after tonsillectomy.
- ▶ **Method:** 32-question survey was disseminated via the American Academy of Otolaryngology-Head and Neck Surgery electronic newsletter, regarding adverse events after tonsillectomy, capturing demographic data, risk factors, and detailed descriptions. N=552.
- ▶ **Results:** events occurred in 38 children (71%), 15 adults (25%) The events were classified as: pulmonary/cardiorespiratory factors (20%), hemorrhage (16%), perioperative events (7%), progression of underlying disease (5%), or unexplained (31%). Of unexplained events, all but one occurred outside the hospital.

Defenderfer, J. W., Friedman, E. M., Glover, C. D., McGilberry, M., Lanier, D. R., Olufoye, O. A., & Walcho, M. F. (2010). The effect of intraoperative dexmedetomidine on postoperative analgesia and sedation in pediatric patients undergoing tonsillectomy and adenoidectomy. *Pediatric Anesthesiology*, 1(1), 490-495. <http://dx.doi.org/10.1213/ANE.0b013e3181833429>

- ▶ **Objectives:** double-blind, randomized controlled study to determine the effects of intraoperative dexmedetomidine on postoperative recovery including pain, sedation, and hemodynamics in pediatric patients undergoing tonsillectomy and adenoidectomy.
- ▶ **Method:** One hundred nine patients were randomized to receive a single intraoperative dose of dexmedetomidine 0.75 µg/kg, dexmedetomidine 1 µg/kg, morphine 50 µg/kg, or morphine 100 µg/kg over 10 minutes after endotracheal intubation.
- ▶ **Results:** The median time to first postoperative rescue analgesic was similar in patients receiving dexmedetomidine 1 µg/kg and morphine 100 µg/kg, but significantly longer compared with patients receiving dexmedetomidine 0.75 µg/kg or morphine 50 µg/kg ($P < 0.01$). The use of dexmedetomidine 1 µg/kg and morphine 100 µg/kg had the advantages of an increased time to first analgesic and a reduced need for additional rescue analgesia doses, without increasing discharge times.

2/26/18

Greenberg, J., Mattos, J. L., Robison, J. G., & Yelon, R. F. (2014). Acetaminophen plus ibuprofen versus opioids for treatment of post-tonsillectomy pain in children. *International Journal of Pediatric Otorhinolaryngology*, 78, 1671-1676. <http://dx.doi.org/10.1016/j.ijporl.2014.07.017>

- **Objectives:** To determine the efficacy and safety of acetaminophen plus ibuprofen in treatment of post-tonsillectomy pain compared to acetaminophen plus opioids in children.
- **Method:** Children undergoing total tonsillectomy (n = 1065). Analysis included descriptive analysis, chi-square testing, and logistic regression for differences of outcomes: (1) post-operative bleeding, (2) emergency department visits for pain/dehydration/bleeding.
- **Results:** Ibuprofen did not increase the risk of bleeding or the likelihood of a post-operative ED visit. Ibuprofen prescription may possibly increase the risk of multiple bleeding episodes, but further prospective studies are needed. Increased age increases the risk of bleeding.

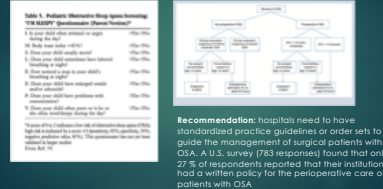
Tekeoglu, U. Y., Apuhan, T., Akkaya, A., Demirkan, A., Yildiz, L., Simsek, T., ... Lerman, J. (2013). Comparison of topical tramadol and ketamine in pain treatment after tonsillectomy. *Pediatric Anesthesia*, 23(4), 496-501. <http://dx.doi.org/10.1111/pan.12148>

- **Objectives:** To evaluate the effects of topically applied ketamine or tramadol on early postoperative pain scores in children undergoing tonsillectomy.
- **Methods:** 60 Children between ages of 4-10 randomly assigned to group K (ketamine), group T (tramadol HCL solution) and group C (Saline as a control). Ramsay sedation scale and Wong-Baker FACES score used to assess response.
- **Findings:** Statistically significant difference among the groups according to Ramsay Sedation Scales in 40th minute ($P < 0.001$). And in Wong-Baker FACES Pain Rating Scale Score in all time points ($P < 0.004$ for all). Topical tramadol and ketamine seem to be safe, effective, and easy analgesic approach for decreasing tonsillectomy pain.

Gorman, C., Kieran, S., Kirby, A., Lander, L., Oyemwense, N., Robertson, D., & Schwartz, M. (2013). Risk factors for desaturation after tonsillectomy: Analysis of 4092 Consecutive Pediatric cases. *The Laryngoscope*, 123, 2554-2559. <http://dx.doi.org/10.1002/lary.23956>

- **Objectives:** To identify clinical risk factors for oxygen desaturation in the first 24 hours post-tonsillectomy and who requires added monitoring.
- **Method:** N=4092 (total patients undergoing T&A). A retrospective analysis, clinical data were recorded for all patients who desaturated in the postoperative period (n = 294) and randomly selected controls (n = 368). Univariate and Multivariate analysis was performed in order to identify independent risk factors for desaturation.
- **Conclusion:** In a tertiary care setting, it is not possible to identify an algorithm that admits all children at risk of desaturation while permitting the discharge of a high percentage of patients.

Wolfe, R. M., Pomerantz, J., Miller, D. E., Weiss-Coleman, R., & Solomonides, T. (2016). Obstructive sleep apnea: Preoperative screening and postoperative care. *Journal of the American Board of Family Medicine : JABFM*, 29(2), 263-273. <http://dx.doi.org/10.3122/jabfm.2016.02.150285>



Putting it all together for the SRNA

- Understand the risks brought on by OSA and by the T & A procedure
- Know your patients! Use the OSA specific tools of evaluating the patient such as IM SLEEPY and AHI. It only adds a few steps to your preoperative evaluation.
- Be aware of the physiological changes (upregulation of MU receptors) brought on by OSA, while formulating anesthetic plan.
- For a T&A, judicious opioid administration is good! Multimodal pain management is even better!
- Be prepared to share the airway with the surgeon
- Airway management techniques save lives! Know your equipment, where to find it and how to use it.

Putting it all together for the SRNA

- Anticipate some degree of airway obstruction postoperatively: secretions, swelling. Suction and reposition patient as necessary for transport to PACU to ensure airway patency.
- Patient is at risk for respiratory depression/airway obstruction all throughout the perioperative period, and beyond the post op period. With your anesthetic plan, set patient up for success that goes beyond the change in care provider.
- Be vigilant! No one can predict when an adverse event will happen, but every anesthesia provider should know how to recognize one, and how to treat it!

2/26/18

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Appendix E

Poster



Pediatric Guide to Tonsillectomy and Adenoidectomy

ABSTRACT

- The purpose of this scholarly project was to increase the knowledge base of the ADU SRNA 2019 cohort regarding multimodal pain management techniques for pediatric T&A's.
- The population most likely to require T&A are children with OSA who are at highest risk for morbidity and mortality.
- An educational Power Point addressing evidence based preoperative, intraoperative, and postoperative pain management techniques for children undergoing a T&A was devised.
- Involvement in the pretesting and posttest assessment was voluntary.
- For statistical analysis, paired samples t-tests were conducted to analyze the data with a P value < .001 which is statistically significant. It can be concluded that the average scores increased significantly.



Elma Clark, BSN, SRNA and Jose Hurtado BSN, SRNA
 Project mentor: Niki Bolin, MSNA, CRNA; US Anesthesia Partners
 Committee Chair: Sarah Snell, DNP, CRNA; ADU NAP Department
 Nurse Anesthesia Program, Adventist University of Health Sciences



PROBLEM

Currently, however, there is no set standard for perioperative pain management for the pediatric T&A patient in either ambulatory or inpatient settings, which has led to respiratory compromise.

PICOT Questions

- In pediatric patients undergoing a tonsillectomy and adenoidectomy (P), how do narcotic medications (I) compare to other modalities of analgesia (C) affect pain management and respiratory depression (O) within the perioperative period (T)?
- Educational innovation is addressed in the second question: In Adventist University student nurse anesthetists (P), does a 30-minute (T) PowerPoint presentation regarding multimodal pain management approaches for pediatric T&A patients (I) result in an increase in the knowledge base (O)?

The potential to improve efficiency with multimodal analgesia is advocated for management of pediatric perioperative pain by concurrently targeting different analgesic mechanisms and reducing the dose requirements of single agents, therefore, minimizing dose-dependent adverse effects (St. John-Green, St John-Green, & Wong, 2013).

Table 2. Pediatric Observation Group Score Assessment: "Is My Child?" Questionnaire (Parent Version)"

Item	Yes	No
1. Is your child often irritable and angry?	Yes (10%)	No (90%)
2. Does your child usually cry?	Yes (10%)	No (90%)
3. Does your child usually smile?	Yes (10%)	No (90%)
4. Does your child usually have a good mood?	Yes (10%)	No (90%)
5. Does your child usually have a good appetite?	Yes (10%)	No (90%)
6. Does your child usually have a good sleep?	Yes (10%)	No (90%)
7. Does your child usually have a good behavior?	Yes (10%)	No (90%)
8. Does your child usually have a good personality?	Yes (10%)	No (90%)
9. Does your child usually have a good attitude?	Yes (10%)	No (90%)
10. Does your child usually have a good character?	Yes (10%)	No (90%)

Wolfe et al., 2016

RESULTS

- The paired samples t-test was conducted to compare the pre-test and post-test average scores. The obtained t is -5.676 (p < .001) which is statistically significant. It can be concluded that the average scores increased significantly (from pre-test 60.77% to post-test 93.08%).

Paired Samples Statistics				
	Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	60.792	26	29.51922
	Post-Test	93.0769	26	9.28191

Paired Samples Test								t	df	Sig. (2-tailed)
		Paired Differences								
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
					Lower	Upper				
Pair 1	Pre-Test	-32.30769	29.02519	5.69231	-44.03122	-20.58417	-5.676	25	.000	
	Post-Test									

CONCLUSIONS

- The implementation of an educational Power Point on a pediatric guide to tonsillectomy and adenoidectomy showed that the knowledge base of the nurse anesthesia students belonging to the ADU cohort class of 2019 increased substantially from baseline.
- This demonstrates a potential positive impact that a power point lecture can have in the development of the nurse anesthesia students.

References available upon request