



Quality-Based Procedure

*Tonsillectomy
with or without Adenoidectomy*

TOOLKIT

Introduction

Quality-Based Procedures (QBP) are an integral part of Ontario's Health System Funding Reform (HSFR) and a key component of Patient-Based Funding. This reform plays a key role in advancing the government's quality agenda and its *Action Plan for Health Care*. HSFR has been identified as an important mechanism to strengthen the link between the delivery of high quality care and fiscal sustainability.

QBP involve clusters of patients with clinically related diagnoses or treatments. The Ministry of Health and Long-Term Care recognizes that paediatric procedures require a different set of considerations that take into account the relatively small critical mass of patients (when compared to the adult population), as well the increased complexity of certain procedures when being performed on, or delivered to, a paediatric patient.

The key objectives of the QBP for Tonsillectomy (with and without Adenoidectomy) are to:

- Provide clinicians with evidence-based recommendations on the pre-, intra- and post-operative care and management of paediatric patients undergoing tonsillectomy with or without adenoidectomy.
- Emphasize the need for evaluation and intervention in high-risk populations, including patients with suspected severe obstructive apnea syndrome (OSAS).
- Promote appropriate and timely counseling and education for patients, parents and caregivers.
- Reduce inappropriate or unnecessary variations in care, including the following:
 - Appropriate use of steroids,
 - Unnecessary administration of antibiotics, and
 - Inappropriate use of codeine.
- Reduce Emergency Department (ED) revisit rates and post-surgery readmission rates due to the most common complications (e.g. dehydration, hemorrhage following surgical procedure, pain, and respiratory complications).
- Ensure appropriate follow-up care strategies are in place.

This toolkit serves as a complement to the QBP Clinical Handbook for Tonsillectomy (with and without Adenoidectomy). The toolkit details the clinical pathway and the tools clinicians can use to implement the QBP.

Additional Resources:

For more detailed information about the QBP, its development and recommendations, a copy of the Clinical Handbook can be downloaded from the Ministry of Health and Long-Term Care website.

For information regarding the implementation of QBP, the Ontario Hospital Association has created a toolkit to support the implementation of QBP. It can be downloaded at:

<http://www.oha.com/KnowledgeCentre/Library/Toolkits/Pages/Default.aspx>

Clinical Pathway Recommendations

The following recommendations were highlighted by the Tonsillectomy QBP Clinical Expert Advisory Group as the key recommendations that should be prioritized for implementation.

Phase 1: Pre-Operative

#	Grade ¹	Recommendations	Evidence to Support Recommendations
1.1 Pre-Operative Assessment			
1.1.1	C	<p>Risk Factors for Post-Operative Bleeding</p> <p>Prior to operative intervention patients should undergo a risk assessment for post-operative hemorrhage. This should include:</p> <ul style="list-style-type: none"> Both a patient history and family history of bleeding disorders. Patients with a negative bleeding history do not require routine coagulation screening prior to surgery. Medication history assessment to determine potential risks for increased post-operative hemorrhage in children who are taking Over the Counter (OTC) and/or natural health products and/or prescription medications. 	<p><u>Literature Review</u></p> <p>This recommendation is consistent with the Guidelines on the assessment of bleeding risk prior to surgery or invasive procedures, from the British Committee for Standards in Haematology, which states that “patients undergoing surgery should have a bleeding history taken. This should include detail of previous surgery and trauma, a family history, and detail of anti-thrombotic medication” (Chee, Crawford, Watson, & Greaves, 2008).</p> <p>In addition, the following analysis informed the development of this recommendation:</p> <ul style="list-style-type: none"> A cost-effectiveness analysis of coagulation testing prior to tonsillectomy and adenoidectomy in children (Cooper, Smith, & Ritchey, 2010).
1.1.2	C	<p>Diagnosis of Obstructive Sleep Apnea Syndrome (OSAS)</p> <p>OSAS is one of the major risk factors contributing to the occurrence of postoperative respiratory complications. An overnight sleep study (polysomnography) is considered to be the gold standard for diagnosis of OSAS. In Ontario access to polysomnography services for children is a challenge due to limited paediatric sleep laboratory availability in the province. The resulting long wait lists preclude screening by</p>	<p><u>Literature Review</u></p> <p>The following studies informed the development of this recommendation:</p> <ul style="list-style-type: none"> Urgent adenotonsillectomy: an analysis of risk factors associated with postoperative respiratory morbidity (Brown, et al., 2003). Outcome, risk, and error and the child with obstructive sleep apnea [Review] (Brown, 2011). A systemic review of obstructive

¹ The grade of recommendation relates to the strength of the supporting evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation. The definitions of the types of evidence and the grading of recommendations used in this document originate from the Oxford Centre for Evidence-based Medicine (CEBM) Levels of Evidence framework (Howick, 2009).

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		<p>polysomnography for every patient suspected of having OSAS.</p> <p>In the absence of a sleep study, patient history and examination using physical markers and overnight oxymetry monitoring can be used to determine the presence of risk factors.</p>	<p>sleep apnea and its implications for anesthesiologists (Chung, Yuan, & Chung, 2008).</p> <ul style="list-style-type: none"> • Morbidity after adenotonsillectomy for paediatric obstructive sleep apnea syndrome: waking up to a pragmatic approach (Leong & Davis, 2007). • Clinical practice guideline: Diagnosis and management of childhood obstructive sleep apnea syndrome (Marcus, et al., 2012). • Tonsillectomy and adenoidectomy in children with sleep-related breathing disorders: Consensus Statement of a UK Multidisciplinary Working Party (Robb, et al., 2009). • Wait times for sleep apnea care in Ontario: A multidisciplinary assessment (Rotenberg, George, Sullivan, & Wong, 2010).
1.1.3	C	<p>Pre-operative assessment of patients with known or suspected OSAS</p> <p>A standardized approach to the assessment of children with suspected OSAS, as defined by the Clinical Practice Guideline for diagnosis and management of childhood OSAS from the American Academy of Paediatrics, is recommended:</p> <p><u>History</u></p> <ul style="list-style-type: none"> • Frequent snoring (≥3 nights/wk) • Labored breathing during sleep • Gasp/snorting noises/observed • Episodes of apnea • Sleep enuresis (especially secondary enuresis after at least 6 months of continence) • Sleeping in a seated position or with the neck hyper extended • Cyanosis • Headaches on awakening • Daytime sleepiness • Attention-deficit/hyperactivity disorder • Learning problems <p><u>Physical examination</u></p> <ul style="list-style-type: none"> • Underweight or overweight • Tonsillar hypertrophy • Adenoidal facies 	<p><u>Literature Review</u></p> <p>In addition to the Clinical Practice Guideline for diagnosis and management of childhood obstructive sleep apnea syndrome, from the American Academy of Paediatrics (Marcus, et al., 2012), and the Consensus Statement from the UK Multidisciplinary Working Party on Tonsillectomy and adenoidectomy in children with sleep-related breathing disorders (Robb, et al., 2009), the following evidence informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Urgent adenotonsillectomy: an analysis of risk factors associated with postoperative respiratory morbidity (Brown, et al., 2003). • Morbidity after adenotonsillectomy for paediatric obstructive sleep apnea syndrome: waking up to a pragmatic approach (Leong & Davis, 2007).

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		<ul style="list-style-type: none"> • Micrognathia/retrognathia • High-arched palate • Failure to thrive • Hypertension <p>Patients with suspected severe OSAS should be considered for admission to hospital for their surgery. The accepted criterion for severe OSAS is defined as an apnea-hypopnea index (AHI) greater than 10 events per hour (Robb, et al., 2009). Other markers that should be considered for surgery as an inpatient include oxygen saturation nadir < 80% and carbon dioxide retention.</p>	
1.1.4	C	<p>Indications for paediatric respiratory investigation</p> <p>The following indications should be considered for paediatric respiratory investigations such as a sleep study, pulmonary function tests, overnight oxymetry monitoring and an arterial blood gas:</p> <p><u>As outlined in the Consensus Statement of a UK Multidisciplinary Working Party:</u></p> <ul style="list-style-type: none"> • Diagnosis of OSAS unclear or inconsistent • Down syndrome • Cerebral palsy • Hypotonia or neuromuscular disorders • Significant Craniofacial anomalies • Mucopolysaccharidosis • Obesity (body mass index > 2.5 standard deviation scores or > 99th %ile for age and gender) • Significant co-morbidity such as congenital heart disease, chronic lung disease • Residual symptoms after adenotonsillectomy <p><u>Other indications based on the CEAG consensus:</u></p> <ul style="list-style-type: none"> • Age < 2 years • Failure to thrive • Pulmonary hypertension • Sickle cell disease 	<p><u>Literature Review</u></p> <p>The following evidence informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Clinical Practice Guideline for diagnosis and management of childhood obstructive sleep apnea syndrome from the American Academy of Paediatrics (Marcus, et al., 2012). • Urgent adenotonsillectomy: an analysis of risk factors associated with postoperative respiratory morbidity (Brown, et al., 2003). • Consensus Statement from the UK Multidisciplinary Working Party on tonsillectomy and adenoidectomy in children with sleep-related breathing disorders (Robb, et al., 2009).
1.1.5	D	<p>Investigation of Pre-Operative Fever</p> <p>Fever is an indication for cancelling paediatric surgery.</p>	<p><u>CEAG Consensus</u></p>

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1.2 Pre-Operative Hydration and Fasting			
1.2.1	D	<p>Hydration and Fasting Guidelines</p> <ul style="list-style-type: none"> • Intake of water and other clear fluids is permitted up to 2 hours before induction of anaesthesia. • Breast milk may be given up to 4 hours before induction of anaesthesia. • Formula or cow's milk may be given up to 6 hours before induction of anaesthesia. • Solid food may be given up to a minimum of 6-8 hours before induction of anaesthesia. 	<u>CEAG Consensus</u>
1.2.2	A	<p>Prescription of intravenous (IV) fluids:</p> <ul style="list-style-type: none"> • The use of isotonic fluid (D5W.0.9% NaCl) is recommended in most circumstances to provide routine IV fluid maintenance requirements. 	<p><u>Literature Review and CEAG Consensus</u></p> <p>The following evidence from the Canadian Paediatric Society Acute Care Committee helped inform the development of this recommendation:</p> <ul style="list-style-type: none"> • Risk of acute hyponatremia in hospitalized children and youth receiving maintenance intravenous fluids (Friedman, 2013).
Pre-Operative Parental/Caregiver and Patient Education			
1.3.1	D	<p>Counseling Topics</p> <p>Parental/caregiver anxiety is a common phenomenon and can be a significant predictor of child anxiety before surgery. Timely information, tailored to the needs and concerns of parents/caregivers and children, is recommended in order to decrease intra-operative stress for the child, improve patient compliance, improve outcomes and family satisfaction. The following topics should be incorporated into the routine pre-operative counseling:</p> <p><u>Medication</u></p> <ul style="list-style-type: none"> • Acknowledgement/ warning regarding potential risks associated with over-the-counter, natural health products and prescription medications. <p><u>Nutrition</u></p> <ul style="list-style-type: none"> • Fasting guidelines for the child. • Counseling regarding appropriate nutrition for parents on the day of surgery 	<p><u>Literature Review and CEAG Consensus</u></p> <p>There is little published evidence concerning the effectiveness of, and satisfaction with, provision of parental/caregiver education specific to tonsillectomy/adenoidectomy. The CEAG identified a number of studies pertaining to the general issue of parental anxiety before surgery in children, including the following:</p> <ul style="list-style-type: none"> • Reducing the anxiety of children undergoing surgery: parental presence during anaesthetic induction (Cameron, Bond, & Pointer, 1996). • A psychological preoperative program: effects on anxiety and cooperative behaviors (Cuzzocrea F, 2013). • Informing parents about anaesthesia for children's surgery:

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		<p>(to ensure they remember to manage their own nutritional needs).</p> <p><u>Anaesthesia Care</u></p> <ul style="list-style-type: none"> Information regarding the risks associated with specific pain management options, such as morphine, in order to allay potential anxiety in parents / caregivers. <p><u>Activity</u></p> <ul style="list-style-type: none"> Post-operative complications, particularly bleeding, are most likely to occur in the 2 weeks after surgery. Therefore, parents should be advised not to plan long trips out of town for a minimum of 2 weeks after the operation. <p>Potential approaches to communicating this information include:</p> <ul style="list-style-type: none"> Individual verbal communication Small group discussions Written pamphlets Videos 	<p>a critical literature review (Franck & Spencer, 2005).</p> <ul style="list-style-type: none"> Teaching the psychosocial aspects of pediatric surgery (Harris, Sibley, Rodriguez, & Brandt, 2013). Family-centered preparation for surgery improves peri-operative outcomes for children (Kain, Caldwell-Andrews, Mayes, Weinberg, & Want, 2007). The effect of preoperative nutritional face-to-face counseling about child's fasting on parental knowledge, preoperative need for information, and anxiety, in pediatric ambulatory tonsillectomy (Klemetti, et al., 2010). Day case tonsillectomy in children: parental attitudes and consultation rates (Kanerva & Tarkkila Pit Karanta, 2003). Homeopathy in the paediatric population (Spigelblatt, 2005). Children and natural health products: What a clinician should know. Position Statement from the Canadian Paediatric Society, Drug Therapy and Hazardous Substances Committee (Vohra & Clifford, 2005).
1.3.2	D	<p>Management of Pre-Operative Anxiety in Children</p> <p>Surgery has been shown to cause anxiety in children, which in turn may result in short and long term negative outcomes. Consideration should be given by the clinical team to providing targeted resources to facilitate patient comfort and to reduce perceived and actual psychological trauma, anxiety, and behavioral issues in children preparing for surgery.</p> <p>Strategies may include, but are not limited to: music therapy, video games, behavioral preparation programs (e.g.: playful dramatization of the operative procedure, manipulation of medical instruments), psychologist's support.</p> <p>A number of provincial institutions are</p>	<p><u>Literature Review</u></p> <p>There is little published evidence concerning the effectiveness of, and satisfaction with, provision of patient education specific to paediatric tonsillectomy. The CEAG identified a number of studies pertaining to the general issue of pre-operative anxiety in children:</p> <ul style="list-style-type: none"> Preoperative parental information and parents' presence at induction of anaesthesia (Astuto, et al., 2006). A psychological preoperative program: effects on anxiety and cooperative behaviors (Cuzzocrea F, 2013). Case report: an unforeseen peril of parental presence during

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		<p>currently facilitating parental presence during induction of anesthesia with good outcomes. The CEAG felt the evidence for the effectiveness of parental presence during induction of anaesthesia was insufficient for them to make a recommendation. This practice should be left to the discretion of individual institutions.</p>	<p>induction of anesthesia (Johnson, Nickerson, & Quezado, 2012).</p> <ul style="list-style-type: none"> • Reducing paediatric anxiety preoperatively: strategies for nurses (St-Onge, 2012). • The effect of performing preoperative preparation program on school age children's anxiety (Vaezzadeh, et al., 2011). • Prevention and intervention strategies to alleviate preoperative anxiety in children: a critical review (Wright, Stewart, Finley, & Buffett-Jerrott, 2007).
1.3.3	D	<p>Pre-Surgical OR Tours</p> <p>The availability of pre-operative Operating Room (OR) tours is recommended. OR tours (either real or virtual) are strongly advised in order to help children prepare for surgery, reduce family uneasiness, increase satisfaction and contribute to establishing an improved service.</p> <p>On the tour, children and parents/caregivers can familiarize themselves with the process and envision what the day of the operation will be like by:</p> <ul style="list-style-type: none"> • Visiting the surgical waiting area, operating room and recovery room, Note: the visit may be virtual • Learning what to expect on the day of surgery, and • Learning about anesthesia. 	<u>CEAG Consensus</u>

Phase2: Intra-Operative

#	Grade	Recommendations	Evidence to Support Recommendations
2.1 Anaesthesia			
2.1.1	A	Topical Anesthetics for IV placement	<u>Literature Review</u> <p>The use of anesthetic cream before intravenous (IV) insertion has been shown to be both safe and effective in decreasing pain during IV placement. A variety of options is available, with no strong evidence in the paediatric literature to recommend one single agent over another based on efficacy.</p> <p>Commonly used preparations include 4% liposomal lidocaine (Maxilene) and 4% amethocaine (Ametop). Applying 0.5 inches (nickel size amount) to the IV insertion site 30 to 60 minutes prior to insertion will provide 1 to 3 hrs of numbing sensation.</p> <p>The following sources informed the development of this recommendation:</p> <ul style="list-style-type: none">• Vascular Access Guideline (BC Provincial Renal Agency, 2011).• A comparison of amethocaine and liposomal lidocaine cream as a pain reliever before venipuncture in children: a randomized control trial (Poonai, Rieder, & Lim, 2012).• Evaluation of a low-dose lidocaine iontophoresis system for topical anesthesia in adults and children: a randomized, controlled trial (Zempsky, Sullivan, Paulson, & Hoath, 2004).• A clinical study to evaluate the efficacy of ELA-Max (4% liposomal lidocaine) as compared with eutectic mixture of local anesthetic cream for pain reduction of venipuncture in children (Eichenfield, Funk, Fallon-Friedlander, & Cunningham, 2002).• Topical anesthetics for intravenous insertion in children: a randomized equivalency study (Kleiber, Sorenson, Whiteside, & Gronstal, 2002).

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2.1.2	B	<p>Local Anesthesia</p> <p>Local intra-operative anaesthetic may be used as a method of reducing post-operative pain. Due to increased risk of bleeding associated with infiltration, topical application of local anesthetic is preferred.</p>	<p><u>Literature Review</u></p> <p>The literature on the use of intra-operative local anesthetic for reduction of post-operative pain is conflicting. A Cochrane Review by Hollis concluded that the efficacy of local anesthetics in reducing pain or need for supplemental analgesia in patients undergoing tonsillectomy/adenoidectomy is lacking (Hollis, Burton, & Millar, 1999). In a 2008 meta-analysis by Grainger et al. it was found that local anesthetics do seem to provide a modest reduction in post-tonsillectomy/adenoidectomy pain. Topical local anesthetic on a swab appears to provide a similar level of analgesia to that of infiltration without the potential adverse effects and may be used for providing additional post-operative analgesia (Grainger & Saravanappa, 2008).</p>
2.2 Medication			
2.2.1	A	<p>Intra-Operative Steroids</p> <p>Based on available evidence, a single intra-operative dose of intravenous steroids (dexamethasone) is strongly recommended as a safe and effective treatment for reducing morbidity from paediatric tonsillectomy/adenoidectomy. Based on available literature, dexamethasone 0.15 mg/kg dose IV is recommended, up to a maximum of 8 mg/dose.</p> <p>Steroids are not recommended for patients with suspected malignancy because of the risks of tumor lysis syndrome including hyperuricemia, hyperkalemia, hyperphosphatemia, hypocalcaemia and acute renal failure.</p>	<p><u>AAO-HNS Guideline</u></p> <p>This recommendation is consistent with the AAO-HNS Guideline which states that “clinicians should administer a single, intra-operative dose of intravenous dexamethasone to children undergoing tonsillectomy. This strong recommendation is based on randomized controlled trials and systematic reviews of randomized controlled trials with a preponderance of benefit over harm” (Baugh, et al., 2011).</p> <p><u>SIGN Guideline</u></p> <p>This recommendation is consistent with the SIGN Guideline which states that a single intra-operative dose of dexamethasone “is recommended to prevent postoperative vomiting in children undergoing tonsillectomy or adenotonsillectomy” (Scottish Intercollegiate Guidelines Network, 2010).</p> <p><u>Literature Review</u></p> <p>In addition to the AAO-HNS and SIGN Guidelines, the following studies helped inform the development of this recommendation:</p> <ul style="list-style-type: none"> • Cochrane Review: Steroids for

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			<p>improving recovery following tonsillectomy in children (Steward, Grisel, & Meizen-Derr, 2011).</p> <ul style="list-style-type: none"> • A 2013 updated systematic review & meta-analysis of 36 randomized controlled trials; no apparent effects of non steroidal anti-inflammatory agents on the risk of bleeding after tonsillectomy (Riggin, Ramakrishna, Sommer, & Koren, 2013). • Dexamethasone and risk of nausea and vomiting and postoperative bleeding after tonsillectomy in children: a randomized trial (Czarnetzki, et al., 2008). • Perioperative dexamethasone administration and risk of bleeding following tonsillectomy in children: a randomized controlled trial (Gallagher, et al., 2012). • Dexmedetomidine versus morphine or fentanyl in the management of children after tonsillectomy and adenoidectomy: a meta-analysis of randomized controlled trials (He, Cao, Shi, & Zhang, 2013). • Dexamethasone reduces postoperative vomiting and pain after pediatric tonsillectomy (Elhakim, Naglaa, I, Riad, & Refat, 2003). • Impact of perioperative dexamethasone on postoperative analgesia and side-effects: Systematic Review and Meta-analysis (Waldron, et al., 2013). • Tumor lysis syndrome: a systematic review of case series and case reports (Firwana, et al., 2012). • Fatal peri-operative acute tumour lysis syndrome precipitated by dexamethasone (McDonnell, Barlow, Campisi, Grant, & Malkin, 2008).
2.2.2	A	<p>Acetaminophen</p> <p>Administration of acetaminophen is strongly recommended for management of post-operative pain.</p>	<p><u>AAO-HNS Guideline</u></p> <p>This recommendation is consistent with the American Academy of Otolaryngology Clinical Practice Guideline for</p>

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		<p>The maximum recommended intra-operative dose of acetaminophen is 20 mg/kg/dose per rectum. Clinicians and nursing staff should receive education regarding rectal administration of non-rectal doses of acetaminophen.</p> <p>The maximum recommended peri-operative oral dose of acetaminophen is 15 mg/kg.</p>	<p>Tonsillectomy in Children, which states that “rectal administration of medication was better tolerated than oral administration of acetaminophen” (Baugh, et al., 2011).</p> <p><u>Literature Review</u></p> <p>The evidence base demonstrates that acetaminophen is effective in reducing opioid requirements following surgery. Moreover, “children with adequate analgesia with acetaminophen have less postoperative nausea and vomiting” (Korpela, Korvenoja, & Meretoja, 1999).</p> <p>Intra-operative use of <i>high dose</i> rectal acetaminophen (25-45 mg/kg/dose) has been investigated in several studies, but its routine use remains controversial (Buck, 2011). These studies assessed the pharmacokinetic effects of high dose acetaminophen over a 24 hour period and did not account for continued high dose administration of acetaminophen (Birmingham, et al., 2001).</p> <p>As per the Health Canada Drug Product Database acetaminophen suppositories are available in the following strengths: 120 mg, 160 mg, 325 mg, and 650 mg. For doses that are significantly smaller than commercially available products, acetaminophen infant drops (80 mg/mL) can be given per rectum.</p> <p>The expert consensus is that rectal absorption of acetaminophen may be erratic (Anderson, Kanagasundaram, & Woollard, 1996), (Walson, Halvorsen, Edge, Casavant, & Kelley, 2013). This absorption pattern may be due to several factors including placement of the suppository and the pH within the rectum. Therefore, oral administration may be considered as an option in the peri-operative period as well as the post-operative period if the patient is able to tolerate medications by mouth.</p> <p>The following dosing reference was used to inform the development of this recommendation:</p> <ul style="list-style-type: none"> • Acetaminophen (Pediatric and

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			Neonatal Lexi-Drugs) (Lexicomp, c1978-2013).
2.2.3	A	<p>Ketamine</p> <p>Ketamine is not recommended for postoperative pain control in paediatric tonsillectomy/adenoidectomy patients.</p>	<p><u>Literature Review</u></p> <p>Recent meta-analysis of clinical trials that used ketamine as a perioperative analgesic in children found that administration of ketamine was associated with decreased PACU postoperative pain intensity and non-opioid analgesic requirements. However, ketamine did not decrease opioid requirements post-operatively (Dahmani, et al., 2011).</p>
2.2.4	A	<p>Intra-Operative NSAIDs</p> <p>NSAIDs (excluding ketorolac) can be safely used for the intra-operative management of pain.</p>	<p><u>AAO-HNS Guideline</u></p> <p>This recommendation is consistent with the American Academy of Otolaryngology Clinical Practice Guideline for Tonsillectomy in Children, which states that “NSAIDs, ketorolac excluded, can be safely used for the postoperative treatment of pain following tonsillectomy. Post-tonsillectomy hemorrhage rates with ketorolac range from 4.4% to 18%, and therefore ketorolac use should be avoided” (Baugh, et al., 2011).</p> <p><u>Literature Review</u></p> <p>A review from the Cochrane Collaboration found that “NSAIDs did not significantly alter the number of peri-operative bleeding events requiring surgical intervention” and that “there was significantly less nausea and vomiting when NSAIDs were used compared to alternative analgesics” (Cardwell, Siviter, & Smith, 2005). This review included 15 clinical trials which compared NSAIDs with other analgesics or placebo and looked at bleeding requiring surgical intervention.</p>
2.2.5	C	<p>Analgesia for patients with known or suspected OSAS</p> <p>Evidence indicates increased sensitivity to narcotics and other anesthetic drugs with central respiratory and sedating effects, among patients with OSAS and obesity. An individualized anesthesia plan should be recommended for this population in order to avoid respiratory function compromise.</p>	<p><u>Literature Review</u></p> <p>This recommendation is consistent with the Consensus Statement from the UK multidisciplinary working party on “Tonsillectomy and adenoidectomy in children with sleep-related breathing disorders”, which states that “children with severe OSA are acutely sensitive to the respiratory depressant effects of opioids and inhalational anaesthetic agents” and</p>

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		<p>Of note, the use of opioids, including morphine, hydromorphone and fentanyl, should be minimized in diagnosed or suspected patients with OSAS, as these drugs may cause a dose-dependent reduction of respiratory drive, respiratory rate, and tidal volume that in turn can lead to hypoventilation, hypoxemia, and hypercarbia.</p>	<p>that “avoidance or careful titration of opioids is advised” (Robb, et al., 2009).</p> <p>In addition, the following evidence informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Perioperative complications during use of an obstructive sleep apnea protocol following surgery and anesthesia (Bolden, Smith, Auckley, Makarski, & Avula, 2007). • A systemic review of obstructive sleep apnea and its implications for anesthesiologists (Chung, Yuan, & Chung, 2008). • Preoperative and postoperative management of obstructive sleep apnea patients (Mickelson, 2007).

Phase3: Post-Operative

#	Grade	Recommendations	Evidence to Support Recommendations
3.1 Medication			
3.1.1	A	<p>Acetaminophen, Ibuprofen and Morphine</p> <p>Acetaminophen and morphine are recommended as primary pharmacologic agents for treatment of post-operative pain. Ibuprofen may be used if there are tolerance issues with morphine or if pain control is inadequate with acetaminophen and morphine.</p> <p>Recommended dosing guidelines for <u>routine administered medications</u></p> <ul style="list-style-type: none"> • Acetaminophen: 15 mg/kg/dose PO or PR every 4 to 6 hours as needed (not to exceed 75 mg/kg/day or 4 grams/day, whichever is less). • Ibuprofen: 5-10 mg/kg/dose PO every 6 to 8 hours as needed (not to exceed 40 mg/kg/day or 2.4 grams/day, whichever is less). <p>Administration for breakthrough pain</p> <ul style="list-style-type: none"> • Morphine: Start low and titrate up with small increments.^{2,3} <ul style="list-style-type: none"> ○ Intravenous Suggested maximum starting dose is 0.05 mg/kg/dose IV q2-4 hours as needed with a usual maximum starting dose of 2.5 to 5 mg/dose. ○ Oral Maximum starting dose is 0.1 to 0.2 mg/kg/dose PO q4-6h as needed with a usual maximum starting dose of 10 mg/dose. 	<p><u>CEAG Consensus (Morphine)</u></p> <p><u>Literature Review</u></p> <p>Acetaminophen and morphine are recommended for the treatment of postoperative pain in tonsillectomy patients. When prescribed within the recommended dosing guidelines, they are safe and effective at relieving postoperative pain. Both morphine and acetaminophen can be administered orally and rectally.</p> <p>The following dosing references were used in the development of this recommendations:</p> <ul style="list-style-type: none"> • Acetaminophen (Pediatric and Neonatal Lexi-Drugs) (Lexicomp, c1978-2013). • Ibuprofen (Pediatric and Neonatal Lexi-Drugs) (Lexicomp, c1978-2013). • Morphine (systemic) (Pediatric and Neonatal Lexi-Drugs) (Lexicomp, c1978-2013). <p>In addition, the following sources informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Assessment and Management of Pain Nursing Best Practice Guideline, from the Registered Nurses Association of Ontario (RNAO, 2007). • Drug Handbook and Formulary from the Hospital for Sick Children (Lau, 2009). • Pediatric Doses of Commonly Prescribed Medications from the Children's Hospital of Eastern Ontario (CHEO, 2011).
3.1.2	A	Codeine	<u>AAO-HNS Guideline</u>

² Doses are provided for pediatric patients greater than 6 months of age. Ideal body weight should be used to calculate doses for patients greater than the normal weight for their height.

³ See cautionary note of increased sensitivity to narcotics and other anesthetic drugs with central respiratory and sedating effects, among patients with obstructive sleep apnea and/or obesity (recommendation #2.2.5)

#	Grade	Recommendations	Evidence to Support Recommendations
		<p>Due to the pharmacogenetic variability in the CYP 2D6 enzyme and the unpredictable response to codeine, avoid codeine use in children less than 18 years of age undergoing tonsillectomy or adenoidectomy for the treatment of post-operative pain.</p> <p>In addition to codeine, other opioids that are metabolized by cytochrome P-450 (CYP) 2D6 isoenzyme to active metabolites (for example oxycodone) should be avoided in pediatric patients as genetic polymorphism of CYP2D6 can lead to variations in drug metabolism which, in turn, can lead to variable drug effect. Excluding codeine, the repercussions of this variability have yet to be fully elucidated in the paediatric or adult population.</p>	<p>This recommendation is consistent with the American Academy of Otolaryngology Clinical Practice Guideline for Tonsillectomy in Children, which states that “acetaminophen with codeine does not provide superior control of pain compared with acetaminophen only following tonsillectomy either at rest or with swallowing” (Baugh 2011).</p> <p><u>Literature Review</u></p> <p>The activity of codeine depends on CYP2D6 activity and its ability to convert it to morphine. 75% to 92% of the population have normal activity of CYP2D6 and fall into the extensive metabolizers group. The concern is for those individuals who have poor function of CYP2D6, thus experiencing little to no analgesic effect, and the ultra rapid metabolizers who are able to convert codeine into large amounts of morphine, putting them at risk of toxicity.</p> <p>The following sources informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Codeine, ultrarapid-metabolism genotype, and postoperative death (Ciszkowski, Madadi, Phillips, Lauwers, & Koren, 2009). • Pharmacogenetics implementation consortium (CPIC) guidelines for codeine therapy in the context of cytochrome P450 2D6 (CYP2D6) genotype (Crews, et al., 2012). • Pharmacogenetics of codeine metabolism in an urban population of children and its implications for analgesic reliability (Williams, Patel, & Howard, 2002). • No pain relief from codeine? An introduction to pharmacogenomics (Fagerlund & Braaten, 2011). • More codeine fatalities after tonsillectomy in North American children (Kelly, et

#	Grade	Recommendations	Evidence to Support Recommendations
3.1.3	D	<p>Cox-2 Inhibitors</p> <p>Cyclooxygenase-2 (COX-2) inhibitors such as celecoxib are not recommended for postoperative pain control in paediatric patients⁴.</p>	<p>al., 2012).</p> <p><u>Literature Review</u></p> <p>In adult patients, celecoxib has an approved indication for short term management of postoperative pain. In children less than 18 years of age, however, the only approved indication is for the treatment of pain associated with juvenile rheumatoid arthritis. Another COX-2 inhibitor, Rofecoxib, has been studied in pediatric postoperative pain as a result of tonsillectomy, but has since been taken off the market due to adverse effects.</p> <p>The following evidence informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Comparative study of acetaminophen-morphine versus rofecoxib-morphine for post-tonsillectomy pain control (Vallée, Carignan, Lafrenaye, & Dorion, 2007). • Post-tonsillectomy pain management in children: can we do better? (Bean-Lijewski, Kruitbosch, Hutchinson, & Browne, 2007). • Dosing celecoxib in pediatric patients with juvenile rheumatoid arthritis (Krishnaswami, et al., 2012). • Celecoxib Product Monograph (Pfizer Inc, 2013).
3.1.4	B	<p>Post-Operative NSAIDs</p> <p>NSAIDs (excluding ketorolac) can be safely used for the management of pain, nausea and vomiting following tonsillectomy.</p>	<p><u>AAO-HNS Guideline</u></p> <p>This recommendation is consistent with the <u>AAO-HNS Clinical Practice Guideline for Tonsillectomy in Children</u> (Baugh, et al., 2011).</p> <p><u>Literature Review</u></p> <p>Current evidence, including the 2005 review by the Cochrane Anaesthesia Group (Cardwell, Siviter, & Smith, 2005) and the 2013 updated systematic review & meta-analysis of 36 randomized controlled trials from the <u>Journal of Clinical Otolaryngology</u></p>

⁴ Additional research into efficacy and safety of celecoxib is underway, and this recommendation may be updated in the future.

#	Grade	Recommendations	Evidence to Support Recommendations
			(Riggin, Ramakrishna, Sommer, & Koren, 2013), indicates that NSAIDs can be considered as a safe method of analgesia among children undergoing tonsillectomy.
3.1.5	A	Antibiotics There is no evidence to support the routine use of antibiotics for infection prevention or to reduce post-operative bleeding. Individual consideration should be taken into account in instances where other co-morbidities may require the use of antibiotics in facilitating post-tonsillectomy recovery.	<u>Literature Review, CEAG Consensus</u> The following studies informed the development of this recommendation: <ul style="list-style-type: none"> • Antibiotics to reduce post-tonsillectomy morbidity: A review from the Cochrane Ear, Nose and Throat Disorders Group (Dhiwakar, Clement, Mrinal, & McKerrow, 2012). • Cefprozil treatment of persistent and recurrent acute otitis media (Pichichero ME, et al., 1997).
3.2 Post-Discharge Planning and Complication Management			
3.2.1	D	Management of Post-Operative Bleeding Follow-up assessment and potential referral to a paediatrician for investigation of underlying causes of bleeding should be considered in cases of bleeding that require readmission/hospital intervention.	<u>CEAG Consensus</u>
3.2.2	D	Management of Post-Operative Fever Most cases of fever post-tonsillectomy are the result of dehydration based on clinical assessment. Therefore, dehydration should be ruled out as the first approach in children who present to ER after tonsillectomy. Further investigation may be required.	<u>Literature Review, CEAG Consensus</u> In addition to the CEAG consensus, the following study informed the development of this recommendation: <ul style="list-style-type: none"> • A study of postoperative fever following paediatric tonsillectomy (Anand, Phillipps, Allen, Joynson, & Fielder, 1999).
3.2.3	C	Guidelines for Observation due to Respiratory Complications Consideration should be given to an extended period of post-operative observation if there is a significant co-morbidity, which may include: <ul style="list-style-type: none"> • Age <2 • Obesity (body mass index > 2.5 standard deviation scores or > 99th percentile for age and gender) • OSAS without pulmonary 	<u>Literature Review</u> The following evidence informed the development of this recommendation: <ul style="list-style-type: none"> • Clinical Practice Guideline: Diagnosis and management of childhood obstructive sleep apnea syndrome (Marcus, et al., 2012). • Tonsillectomy and Adenoidectomy in Children with Sleep-Related Breathing Disorders: Consensus

#	Grade	Recommendations	Evidence to Support Recommendations
		<p>hypertension or co-morbidities</p> <ul style="list-style-type: none"> • Sickle cell anemia • Carbon dioxide retention 	<p>Statement of a UK Multidisciplinary Working Party (Robb, et al., 2009).</p>
3.2.4	C	<p>Guidelines for Pre-op Referral due to Respiratory Complications</p> <p>Consideration should be given to referral to a tertiary centre if there is a significant co-morbidity, which may include:</p> <p><u>As outlined in the Consensus Statement of a UK Multidisciplinary Working Party:</u></p> <ul style="list-style-type: none"> • Down syndrome • Significant craniofacial anomalies • Significant co-morbidity such as congenital heart disease, chronic lung disease • ECG or echocardiographic abnormalities • Hypotonia or neuromuscular disorders (moderately or severely affected) <p><u>Other indications based on the CEAG consensus</u></p> <ul style="list-style-type: none"> • Age < 18 months • Age <3 yrs PLUS pulmonary hypertension OR significant co-morbidity • Failure to thrive due to severe OSAS (described by polysomnographic indices including Obstructive Index > 10, Respiratory Disturbance Index > 40, and Oxygen saturation nadir < 80%) • Severe cerebral palsy • Mucopolysaccharidosis and syndromes associated with a difficult airway 	<p><u>Literature Review</u></p> <p>The following evidence informed the development of this recommendation:</p> <ul style="list-style-type: none"> • Clinical Practice Guideline: Diagnosis and management of childhood obstructive sleep apnea syndrome (Marcus, et al., 2012). • Tonsillectomy and Adenoidectomy in Children with Sleep-Related Breathing Disorders: Consensus Statement of a UK Multidisciplinary Working Party (Robb, et al., 2009).
3.2.5	D	<p>Guidelines for Hospital Admission due to Respiratory Complications Post-Operatively</p> <p>An individualized approach to hospital admission is recommended for patients who experience respiratory complications post-tonsillectomy.</p>	<p><u>CEAG Consensus</u></p>

#	Grade	Recommendations	Evidence to Support Recommendations
3.3 Patient and Parental/Caregiver Education			

3.3.1 C Post-Operative Pain Management Counseling

The following topics should be incorporated into the routine post-operative counseling on pain management:

Dosing instructions and timing

- Clinicians / Anaesthesia should ensure, thorough communication regarding the doses and timing of analgesics given pre- and intra-operatively with nursing and parents, adequate pain relief while not exceeding maximum safe dosages. Specifically, parents should receive written communication regarding the name, dose and timing of each medication given to the child before discharge. Parents should be instructed to keep a record of the type of pain medication they give and the times it is given. Documentation should include their assessment of the effectiveness of the medication.
- Parents should be warned that the child may experience pain and refuse to return to normal activities for at least 7 days following surgery (Stewart, Ragg, Sheppard, & Chalkiadis, 2012). Pain may interfere with fluid intake leading to dehydration. If the pain does not improve or starts to increase with intensity, parents should follow the action plan that they have been given⁵.

Mixing food with medication

- Clear instructions should be provided for parents who wish to mix their child’s medication with food. Mixing medication with food is not recommended because it may prevent the child from getting the full dose. Parent should be instructed to administer medication that is not mixed with food which can then be followed by food.

⁵ See Recommendation #3.3.3.

#	Grade	Recommendations	Evidence to Support Recommendations
		<p><u>Medication Side-Effects</u></p> <ul style="list-style-type: none"> • Parents should be reassured that, although Morphine is a potent drug, their child is prescribed a dose which is safe to use for their child after tonsillectomy. • Side-effects of morphine should be reviewed to address parental concerns. <p><u>Pain Scale</u></p> <ul style="list-style-type: none"> • A universal pain scale handout should be provided to parents. This tool should work for any age group and for parents of varying levels of education. Instruction must be provided regarding how to use and interpret the scale in order to assess post-operative pain management following discharge. <p><u>Homeopathic and/or naturopathic medications</u></p> <ul style="list-style-type: none"> • If parents are giving homeopathic and/or naturopathic medications to the child, they should obtain a detailed description of the medication from the prescriber listing ingredients and the side effect profile and bring this to their physician. • Homeopathic and/or naturopathic medications should not be mixed with prescription medications without prior consultation with a physician and/or pharmacist. <p><u>Oral Rinses and non-pharmacological alternatives</u></p> <ul style="list-style-type: none"> • Certain rinses such as hydrogen peroxide may not be effective and are potentially dangerous, particularly in younger children who are unable to rinse and spit out the solution. The following non-pharmacological options to keep the pharynx moist and thereby decrease pain are recommended: ice chips, freezies⁶, ice cream. 	
3.3.2	D	<p>Other Post-Operative Counseling Topics</p> <p>In addition to the information regarding pain management strategies outlined in the previous recommendation, parents /</p>	<u>CEAG Consensus</u>

⁶ Snacks of frozen flavored sugar water, fruit juice or fruit purée in a plastic tube.

#	Grade	Recommendations	Evidence to Support Recommendations
		<p>caregivers should be given instructions regarding nutrition, hydration, mouth care and appropriate level of activity. Of note, the importance of adequate liquid intake should be reinforced <i>in order to prevent dehydration</i> after surgery:</p> <p><u>Nutrition & Hydration</u></p> <ul style="list-style-type: none"> • <u>The link between appropriate pain management and hydration should be emphasized.</u> • Information regarding the appropriate post-operative diet, including the list of foods that should be avoided (e.g. hot, spicy, acidic or dry foods that might irritate the throat such as toast, crackers, tomatoes, orange juice and lemonade). <p><u>Mouth Care</u></p> <ul style="list-style-type: none"> • Information regarding the importance of appropriate mouth care, including rinsing and gentle tooth brushing, should be provided. Gargling and/or swishing anything around in the back of the throat is not recommended. <p><u>Activity</u></p> <ul style="list-style-type: none"> • Information regarding the appropriate level of activity, including bathing, should be provided. Rough sports or contact sports that may affect the throat are not recommended. Post-operative complications, particularly bleeding, are most likely to occur in the 2 weeks after surgery. Therefore, parents should be advised not take their child on long trips during this time. 	
3.3.3	D	<p>Action Plan for Parents/Caregivers</p> <p>An Action Plan for Parents/Caregivers should be developed in order to facilitate appropriate management of post-operative complications including bleeding, fever, nausea and pain.</p> <p>Relevant contact information should be provided to ensure an effective 24/7/365 response, particularly in cases of bleeding and/or fever that require hospital intervention. The information that is provided should specify if the number to call varies according to hour or day. Depending on the</p>	<p><u>SIGN Guidelines</u></p> <p>This recommendation is consistent with the SIGN Guidelines which state that “at the time of discharge, patients/carers should be provided with written information advising them whom to contact and at what hospital unit or department to present if they have postoperative problems or complications” (Scottish Intercollegiate Guidelines Network, 2010).</p> <p><u>Literature Review, CEAG Consensus</u></p>

#	Grade	Recommendations	Evidence to Support Recommendations
		<p>facility, this may include a number of avenues, including a “Number to Call” at the hospital, Emergency Department, or a family physician. It is recommended that families remain within 1 hour travel-time from an acute care facility for a period of 14 days.</p>	<p>The following studies informed the development of this recommendation:</p> <ul style="list-style-type: none"> • A randomized clinical trial of a nurse telephone follow-up on paediatric tonsillectomy pain management and complications (Paquette J, 2013). • Follow-up phone calls after pediatric ambulatory surgery for tonsillectomy: what can we learn from families? (Le, Drolet, Parayno, C, & Castiglione, 2007).

Other Considerations

The CEAG identified a number of gaps in the evidence that are high value candidates for future evidence-based analyses:

Cox-2 Inhibitors

- Additional studies are needed to support the safety and efficacy of celecoxib use in paediatric tonsillectomy patients.

Diagnosis of OSAS

- Future research is recommended to evaluate the effectiveness of home-based sleep studies for diagnosis of OSAS in paediatric patients.
- Future research is recommended to evaluate the use of home videos to confirm the presence of OSAS in paediatric patients.
- Future research is recommended to establish acceptable definitions of mild, moderate and severe OSAS.

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