Current Pediatric Tertiary Care Admission Practices Following Adenotonsillectomy

Heather C. Nardone, MD; Katherine M. McKee-Cole, MD; Norman R. Friedman, MD

Importance  Pediatric adenotonsillectomy is a frequently performed procedure. Few studies have examined perioperative practice patterns for children undergoing adenotonsillectomy.

Objective  To assess current group practice patterns associated with the perioperative care of children undergoing adenotonsillectomy for sleep-disordered breathing at tertiary care children's hospitals following the release of the 2011 American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) clinical practice guidelines.

Design, Setting, and Participants  A cross-sectional survey was distributed to the chiefs of 72 pediatric otolaryngology divisions at tertiary care children's hospitals in the United States and Canada from March 25 to April 16, 2014.

Main Outcomes and Measures  Internet-based survey responses from the chiefs of pediatric otolaryngology at tertiary care children's hospitals in the United States and Canada, who responded regarding group, rather than individual, practices.

Results  Of the 72 surveys sent, 48 responses (67%) were received. Twenty-one respondents (44%) reported that their group has no official admission policy for children with sleep-disordered breathing. Seventy-three percent (29 of 40) reported using some measure of obesity as a criterion for postoperative admission. The AAO-HNS polysomnography criteria for severe obstructive sleep apnea were used by 40% of respondents (16 of 40) as admission criteria, whereas 15% (6 of 40) used the American Academy of Pediatrics criteria for severe obstructive sleep apnea. Seventy-three percent (29 of 40) reported requiring a child to be asleep while breathing room air without oxygen desaturation before discharge to home. An established minimum time for observation was reported by 43 of the respondents (90%). Institution size or volume of adenotonsillectomies performed did not affect the results.

Conclusions and Relevance  Many tertiary care children's hospitals in the United States do not have an official admission policy to guide adenotonsillectomy care. Even for institutions that do have an official admission policy, the policies are not universally aligned with the AAO-HNS clinical practice guidelines. These survey results demonstrate an opportunity to improve quality and safety regarding admission policy practice patterns after pediatric adenotonsillectomy.
Adenotonsillectomy is one of the most commonly performed pediatric surgical procedures, with more than 500,000 performed annually. In 2011, the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) published clinical practice guidelines for pediatric adenotonsillectomy.1,2 The guidelines presented evidence-based recommendations intended to improve quality of care. Despite the evidence presented and guidelines suggested, there appears to continue to be great variation in the perioperative care of children undergoing adenotonsillectomy. Recent publications suggest that variation exists across pediatric hospitals in the United States and Canada with regard to admission criteria after adenotonsillectomy.3-4 In addition, deaths at home unrelated to hemorrhage have also been documented in children who have undergone adenotonsillectomy. These events are potentially related to apnea that occurs at home and further underscore the importance of identifying patients in need of further monitoring with hospital admission.5-8 To determine the current practice patterns, including admission practice patterns, for children undergoing adenotonsillectomy at major tertiary care children’s hospitals, a survey was sent via email to the chiefs of pediatric otolaryngology at these institutions regarding their group, rather than individual, practices.

Methods

A 19-question, Internet-based survey (eAppendix in the Supplement) was designed to examine perioperative practice patterns for children undergoing adenotonsillectomy for sleep-disordered breathing at children’s hospitals in the United States and Canada. This survey was designed by fellowship-trained pediatric otolaryngologists (H.C.N. and N.R.F.) and was reviewed by the chief of pediatric otolaryngology at their respective institutions to ensure clarity and relevance. The study was deemed exempt from review by the Nemours/Alfred I. duPont Hospital for Children Institutional Review Board and participant consent was deemed unnecessary. The institutions selected to receive the survey included those on the US News & World Report list of best children’s hospitals9 and represented a mix of both freestanding pediatric hospitals as well as pediatric divisions within adult hospitals. The survey was sent to the chiefs of pediatric otolaryngology departments from March 25 to April 16, 2014. The questions were directed toward practice patterns of the entire department, rather than of the individual. A reminder email was sent on April 9, 2014. The survey was constructed and results were collected using SurveyMonkey software (SurveyMonkey).

Statistical analysis was performed using 2-tailed unpaired t tests and Wilcoxon rank sum tests, as appropriate. Sleep-disordered breathing was defined as signs and symptoms of upper airway obstruction occurring during sleep. Obstructive sleep apnea (OSA) was defined as clinical signs and symptoms of sleep-disordered breathing along with abnormal polysomnography (PSG) results.

Results

Demographics

Of the 72 surveys distributed, 48 responses (67%) were received. Not all questions were answered on some surveys; thus, for some of the questions, the total number of responses was less than 48. The mean (SD) number of hospital beds at the institutions of the respondents was 245.7 (129.0). Respondents had a mean (SD) of 5.8 (3.9) pediatric otolaryngologists in their department. Groups performed a mean (SD) of 857.1 (708.9) tonsillectomies annually. Thirty-four of the respondents (71%) reported that their group performs tonsillectomies at a dedicated children’s hospital always or most of the time.

Postoperative Admission

Twenty-one of the respondents (44%) reported that their group has no official admission policy for children with sleep-disordered breathing. Seven centers (15%) admit all children who have symptoms of OSA but did not have a sleep study performed before adenotonsillectomy, regardless of age. Of the centers that did not have an official admission policy, the chief answered questions regarding postoperative admission according to the way the majority of their group cares for these children. Taking into account the answers of both aforementioned groups, Figure 1 provides the overall admission criteria for the cohort.

Seventy-three percent of the centers (29 of 40) reported using some measure of obesity as a criterion for postoperative admission. Sixty-three percent (25 of 40) use a body mass index (calculated as weight in kilograms divided by height in meters squared) of more than 95% for age as their measure, and 10% (4 of 40) use a body mass index of more than 99% for age. Forty percent of centers (16 of 40) use PSG criteria for severe OSA as defined by the AAO-HNS (apnea-hypopnea index [AHI] ≥ 10 events per hour or oxygen saturation nadir of < 80%), whereas 15% (6 of 40) use the criteria for severe OSA as stated in the 2012 American Academy of Pediatrics guidelines (AHI > 24 events per hour or oxygen saturation nadir of < 80%). No association was observed between either hospital size (P = .45) or number of tonsillectomies performed an-
nually \((P = .86)\) and the use of a measure of obesity or between hospital size \((P = .90)\) or number of tonsillectomies performed annually \((P = .61)\) and the use of AAO-HNS/American Academy of Pediatrics criteria for severe OSA.

For children not admitted postoperatively, 78% of centers (35 of 45) reported that their group requires a child to be asleep while breathing room air without oxygen desaturation before discharge to home. Forty-three centers (90%) have an established minimum time for observation. The amount of time children are observed postoperatively varied widely (Figure 2), with a median of 2 hours. Five centers (10%) reported that their group does not have a minimum time for observation.

Preoperative PSG

Figure 3 reflects the criteria considered regarding when to perform preoperative PSG. Inconsistent history of physical examination was the most common reason (44 groups [92%]). Age younger than 3 years is a routine indication for 10 groups (21%) and age younger than 2 years for 21 (44%). Polysomnography is routinely performed for obese patients in 31 groups (65%) surveyed.

Practice After the AAO-HNS Clinical Practice Guidelines

In 2011, the AAO-HNS published 2 clinical practice guidelines. The first guideline was for adenotonsillectomy; 29 respondents (60%) reported that their group’s practice has changed in some way because of this clinical practice guideline. The focus of the second clinical practice guideline was on PSG before adenotonsillectomy. Only 21% (10 of 47) reported a change in their group’s practice because of this second clinical practice guideline.

Discussion

The 2011 AAO-HNS evidence-based guidelines regarding the perioperative management of children undergoing adenotonsillectomy were intended to reduce practice variation and optimize care. Our survey of group admission practice patterns at tertiary US and Canadian children’s hospitals suggests that although many chiefs report alteration of their perioperative care after the publication of the clinical practice guidelines, all aspects of the guidelines have not been universally accepted, and wide variation persists. Our study sought...
to identify the group practices regarding admission. While additional features of clinical practice surrounding adenotonsillectomy care were queried by the survey, attention was directed to different high-risk features in association with admission decisions.

Recent publications in both the anesthesiology and otolaryngology literature report patients experiencing anoxic brain injury or death after adenotonsillectomy. Of these patients, hemorrhage after adenotonsillectomy accounted for only 31 of 111 patients (27.9%) and 9 of 55 patients (16%). Postoperative apnea following hospital discharge is suspected to be the primary etiologic factor for these unexpected events. To eliminate these outcomes, additional research is necessary regarding the duration and level of monitoring after adenotonsillectomy. Discharge criteria for ambulatory patients should take into consideration that children with OSA often have significant residual obstruction on the first postoperative night. These children may not have respiratory difficulty while awake but can develop significant obstruction and gas exchange abnormalities during sleep.7

In our survey, there was wide variation in the length of postoperative observation for the ambulatory patient, and 10% of respondents reported that their group does not have a minimum observation time. In addition, for children not admitted postoperatively, 22% of respondents (10 of 45) reported that their group does not require the child to be asleep while breathing room air without oxygen desaturation before discharge to home. Four of these 10 institutions reported using a narcotic for postoperative pain control at least 50% of the time. Therefore, especially in high-risk patients, a period of sleep observation in the postanesthesia care unit may be considered to identify those with obstruction necessitating admission for further observation.7

Age younger than 3 years, obesity, or severe OSA confirmed by PSG are known risk factors for postoperative respiratory complications.13 The AAO-HNS advocates for PSG prior to adenotonsillectomy for children with the following comorbidities: obesity, Down syndrome, craniofacial abnormalities, neuromuscular disorders, sickle cell disease, or mucopolysaccharidosis. If these children are diagnosed with severe OSA, the AAO-HNS recommends overnight observation. In our survey, the most uniform criterion for admission was age younger than 3 years, with 92% reporting postoperative admission for these patients. This criterion was also evaluated in a study by Setabutr et al12 in 2014 using survey responses regarding clinical practice following the release of the clinical practice guidelines, where 95 of 234 respondents (40.6%) were found to use age younger than 3 years as an admission criterion. The increase in admission seen in our study is reassuring, as several studies have demonstrated an increased risk for postoperative respiratory complications in children younger than 3 years.8,13 In a retrospective review of 2315 children, Statham et al13 demonstrated a 2-fold increase in respiratory complications after adenotonsillectomy for sleep-disordered breathing in children younger than 3 years: 77 of 1578 children aged 3 to 5 years (4.9%) experienced postoperative respiratory complications, compared with 72 of 737 of those younger than 3 years (9.8%).

Correlation between severity of OSA and risk for postoperative events has also been demonstrated.8,14,15 Forty percent of respondents use PSG criteria for severe OSA as defined by the AAO-HNS (AHI≥10 events per hour or oxygen saturation nadir of <80%) as a criterion for admission and 15% use the criteria for severe OSA as stated in the 2012 American Academy of Pediatrics guidelines (AHI >24 events per hour or oxygen saturation nadir of <80%). In a study by Wilson et al,14 children with an obstructive apnea index of 5 or more events per hour were 7 times more likely to have a postoperative respiratory complication. Likewise, children with an oxygen saturation nadir of 80% or less were 6 times more likely to have a postoperative respiratory event.

Evidence suggests that both obstructive AHI and oxygen saturation nadir should be considered as markers of severity in OSA, as children with a pulse oximetry nadir of 80% or less are 3.1 times more likely to require postoperative respiratory interventions.14 Moreover, a recent prospective study showed an oxygen saturation nadir of less than 80% to be one of the fac-

### Figure 3. Preoperative Polysomnography Criteria

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<tr>
<th>Children for Whom Polysomnography Is Routinely Performed</th>
<th>Respondents Using Criteria, %</th>
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<tbody>
<tr>
<td>Age &lt;2 y</td>
<td></td>
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<tr>
<td>Age &lt;3 y</td>
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<tr>
<td>Trisomy 21</td>
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<tr>
<td>Craniofacial anomalies</td>
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<td>Neuromuscular disorders</td>
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<td>Mucopolysaccharidosis</td>
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<td>Sickle cell disease</td>
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<td>Inconsistent history and clinical examination</td>
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Percentage of respondents using criteria shown as indication for polysomnography before adenotonsillectomy.
tors, along with age younger than 3 years and peak carbon dioxide level of more than 60 mm Hg, that most consistently predicts postoperative respiratory complications, even more so than AHI.11

Studies have also demonstrated that obese children experience significantly more respiratory complications after adenotonsillectomy compared with children of normal weight.16,17 In our survey, 73% of groups reported that their group uses some measure of obesity as a criterion for postoperative admission, but only 63% use body mass index of greater than 95% for age, the measure for obesity as defined by the US Centers for Disease Control and Prevention.18 Fung et al16 found that obese children were nearly 9 times more likely to have postoperative respiratory events, such as oxygen desaturation, airway obstruction, respiratory depression, cough, and bronchospasm, compared with their normal-weight counterparts. In obese patients, those experiencing desaturation events in the immediate postoperative period, 75% (12 of 16) continued to experience respiratory events through the first postoperative night while matched controls showed a rate of only 17% (2 of 12).16 Secondary to the increased risk of postoperative complications, the AAO-HNS advocates preoperative PSG for such high-risk children. Setabutr et al15 found that 90 of 245 respondents (36.7%) cited obesity as a reason to perform PSG; however, it was not listed as a criterion used by the respondents for postoperative admission. If a child is obese and preoperative PSG was not performed, it seems prudent to observe the child overnight owing to the uncertainty of the severity of the obstruction and degree of hypoxemia.

One limitation of our survey was that questions were directed toward group practice patterns. Variability exists in most practices; however, the chief of the department is likely aware of the typical practice patterns of the majority of his or her colleagues. In addition, while the response rate to the survey request was reasonable, at 67%, it is possible that nonrespondents have different practice patterns from those reported here. Finally, this survey was limited to tertiary care centers and may not reflect the practice patterns in the private sector or academic institutions not evaluated in this study.

Conclusions

Many tertiary care children's hospitals in the United States do not have an official admission policy to guide adenotonsillectomy care following the release in 2011 of the AAO-HNS clinical practice guidelines. Even for institutions that do have an official admission policy, the policies are not universally aligned with the AAO-HNS clinical practice guidelines. Institution size or volume of tonsillectomies performed did not affect the results. These survey results demonstrate an opportunity to improve quality and safety regarding admission policy practice patterns after pediatric adenotonsillectomy.

ARTICLE INFORMATION

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Author Contributions: Drs Nardone and Friedman had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Nardone, Friedman. Acquisition, analysis, or interpretation of data: Nardone, McKee-Cole. Drafting of the manuscript: Nardone, Friedman. Critical revision of the manuscript for important intellectual content: All authors. Administrative, technical, or material support: Nardone, McKee-Cole. Study supervision: McKee-Cole, Friedman. Conflict of Interest Disclosures: None reported.

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REFERENCES