Bimodal CI, Pitch/Prosody Perception Differences among Children and Adults

Akiko Sugaya (Presenter); Ryotaro Omichi; Yukihide Maeda; Kunihiro Fukushima; Shin Kariya; Mizuo Ando

Introduction: This study aims to evaluate pitch recognition and prosody perception among prelingual pediatric cochlear implant (CI) users compared with postlingual adult CI, users.

Method: Adults and school-age children who had received CI surgery in Okayama University Hospital were recruited in this study. The participants of both age groups were bilateral, unilateral, and bimodal CI, users. Several adults with normal hearing were also enrolled as the control group. The original “Pitch Recognition and Emotional Prosody Perception Tests” were used in this study. The pitch test consisted of 18 questions asking which of 2 piano notes had the higher frequency, while the prosody test consisted of 12 questions asking participants to report their impression as 1 of 4 listed emotions after listening to presented monosyllable sound vocalizations. The test results among bilateral, unilateral, and bimodal CI, users of both groups were compared by 1-way analysis of variance (ANOVA) and post hoc tests (P < .05).

Results: A total of 19 school-aged CI, users and 20 adult CI, users participated in this study. The control group consisted of 10 normal-hearing adults. The average pitch and prosody test scores were almost completely accurate for the normal-hearing control group but were low among the participating children and adult CI, users, without showing any notable differences between the groups. The ANOVA and post hoc test results revealed that the pitch test performance levels for bimodal adult CI, users were significantly better than those for the bilateral (P < .05) and unilateral (P < .01) CI, users. No notable differences were observed in test scores among the 3 pediatric CI, user groups.

Conclusion: Among the tested adults, bimodal CI, users performed better in the pitch tests than the bilateral and unilateral adult CI, users did. In contrast, the test results for participating children with congenital hearing loss did not demonstrate any significant differences among bilateral, unilateral, and bimodal CI, users. The pitch and prosody acquisition mechanism may be different between children and adult patients with congenital and acquired hearing losses.

Aerodigestive Clinic Reduces Health Care Utilization While Increasing Access to Care

Keith D. Volner, DO (Presenter); Agnes Montgomery; Christine Gould; Brian Liming

Introduction: Aerodigestive patients are complex pediatric patients that require substantially increased health care needs compared with the general population. This study aimed to objectively evaluate the health care utilization outcomes of a multidisciplinary aerodigestive clinic.

Method: We retrospectively analyzed the electronic medical record systems and infrequent screening for immunization. Of the patients with recorded vaccinations, only 44% completed the HPV vaccine series. Therefore, there exists an opportunity to increase the vaccination rate of pediatric otolaryngology patients through improved surveillance and implementation of vaccination programs. Such an intervention could significantly decrease the incidence of HPV-related diseases, including oropharyngeal squamous cell carcinoma.

Aerodigestive Clinic Reduces Health Care Utilization While Increasing Access to Care

Keith D. Volner, DO (Presenter); Agnes Montgomery; Christine Gould; Brian Liming

Introduction: This study highlighted factors associated with decisional conflict and emphasized the need for physicians to engage in shared-decision making with patients. The COVID-19 pandemic contributed to decisional conflict. Consistent discussion of risks and benefits is essential. The role of race and decisional conflict needs further study.

Adolescent Immunization Rates and Surveillance in Pediatric Otolaryngology Clinics

Michal Trope, MD (Presenter); Raisa Tikhtman, MD; Francis Real, MD, Med; Stacey Ishman, MD, MPH

Introduction: In 2019 the Centers for Disease Control and Prevention reported that 54.2% of adolescents aged 13 to 17 years had completed the human papillomavirus (HPV) vaccination series, but the rate within many pediatric otolaryngology clinics is currently unknown. The purpose of this study was to identify how frequently immunization history was collected for patients seen in a pediatric otolaryngology clinic and determine the HPV vaccine completion rate when immunizations were recorded.

Method: This was a retrospective chart review of 13- to 26-year-old patients who presented to a pediatric otolaryngology outpatient clinic from January 2018 to January 2019. Immunization data were collected from our electronic medical record system and included vaccines recommended in early adolescence (11–12 years), including HPV-2, HPV-4, HPV-9, and tetanus, diphtheria, and pertussis (Tdap). Immunization data were analyzed, and vaccination rates were computed.

Results: Within the outlined time period, 4606 patients were seen. The mean age was 16.2 ± 2.7 years; 52% were female, 13.4% were Black, 81.3% were White and 5.3% were other. Of the 4606 patients, only 773 (17%) had vaccine information recorded. Of the 773, 81.4% received at least 1 Tdap vaccine dose, 75.8% received at least 1 HPV vaccine dose and 43.5% completed the HPV vaccine series (HPV-2, HPV-4 or HPV-9). Therefore, only 7% of the patients seen in clinic were reported to be adequately vaccinated for HPV prevention.

Conclusion: Overall, only 14% of patients in our clinic had at least 1 Tdap dose recorded. In addition, only 7% of patients were found to have completed the HPV vaccination series. This is likely due to noncommunicating electronic medical record systems and infrequent screening for immunization. Of the patients with recorded vaccinations, only 44% completed the HPV vaccination series. Therefore, there exists an opportunity to increase the vaccination rate of pediatric otolaryngology patients through improved surveillance and implementation of vaccination programs. Such an intervention could significantly decrease the incidence of HPV-related diseases, including oropharyngeal squamous cell carcinoma.
**Results:** A total of 261 children were included during the study period. Comparing visits before aerodigestive evaluation to after aerodigestive evaluation, there were 6630 encounters before and 6454 after, representing a 2.7% reduction in appointments overall ($P = .601$). The number of ED (−37.5%, $P < .001$) and PC (−39.9%, $P < .001$) visits decreased, while SC (+21.6%, $P = .272$), AC (+18.4%, $P = .051$), and TC (+14.6%, $P = .562$) visits increased. PC visits accounted for nearly one-third (31%) of all visits prior to the initial aerodigestive clinic visit but only 19% of visits after. The distribution of visits differed strongly among age groups. While PC visits decreased for all age groups, ED visits decreased by nearly half (−48.1%, $P < .001$) for ages 1 to 17 years, and there was no change for <1-year-olds. Conversely, TCs increased significantly for <1-year-olds (+47.3%, $P = .011$).

**Conclusion:** There is a statistically significant reduction in the number of ED and PC visits for patients seen in a multidisciplinary aerodigestive clinic with a concomitant increase in the number of ancillary, specialty, and TC encounters. These findings emphasize the positive impact that the multidisciplinary clinic has on health care utilization for pediatric aerodigestive patients.

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**Applicability of TI-RADs in Pediatric Thyroid Nodules**

Stephen Hadford, MD (Presenter); Brandon Hopkins, MD; Daniel Hewes, MD; Rachel Georgopoulos

**Introduction:** The Thyroid Imaging Reporting & Data System (TI-RADs) is used to stratify the risk of nodules and guide further workup. The application of this system was validated in adult patients with thyroid nodules, without clear evidence of its applicability in the pediatric population. The objective of this study was to examine if TI-RADs and its components are useful in predicting which thyroid nodules are malignant in the pediatric population.

**Method:** A retrospective chart review of all patients less than 18 years old, with a listed diagnosis code for thyroid nodules, was performed. Patients with a thyroid ultrasound and a radiologist recorded TI-RADs score of documented thyroid nodules were included. Data on FNA, final pathology, and any surgical intervention were collected as well.

**Results:** A total of 55 patients were identified, including 12 males and 43 females. The age range was 5 to 18 years, with an average age of 15 years. Of the patients who underwent thyroidectomy or biopsy, 7 were malignant and 14 were benign. The distribution among TI-RADs scores was 13% in 1, 18% in 2, 22% in 3, 16% in 4, and 18% in 5. Of the patients who had an underlying malignancy, 42% had a TI-RADs score of 3, 29% had a TI-RADs score of 4, and 29% had a TI-RADs score of 5. Of the TI-RAD findings, taller than wide had the highest positive predictive value of 0.5. Echogenicity not being hypoechoic had a strong negative predictive value (0.5–1.0).

**Conclusion:** The metrics used in TI-RADs had a relatively low positive predictive value for identifying an underlying malignancy and stronger negative predictive values. Given the more aggressive nature of nodules in the pediatric population, the threshold to biopsy a nodule should be lower than indicated in the traditional TI-RADs grading system.

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**Association of Mast Cells in Pediatric Larynx With Aerodigestive Disease**

Emily L. Mace (Presenter); Shilin Zhao, PhD; Christopher T. Wootten, MD; Ryan H. Belcher, MD

**Introduction:** Mast cells have been implicated in respiratory, digestive, and global inflammatory disorders, but the role of mast cell inflammation within the larynx and subsequent aerodigestive pathology is poorly understood. This study analyzes the association of mast cells found on supraglottic biopsy with aerodigestive diseases.

**Method:** This study was approved by the Vanderbilt Institutional Review Board. Pediatric patients undergoing otolaryngology aerodigestive procedures were consented between 2014 and 2019, and biopsies of the supraglottic larynx were collected at the time of their surgery. Pathologists reviewed the biopsies for the presence and number of mast cells. The patients’ electronic health records were reviewed for relevant demographic data and clinical diagnoses present at the time of biopsy.

**Results:** A total of 464 patients were biopsied and assessed for mast cells. Patients with mast cells present in their biopsy were significantly more likely to have gastroesophageal reflux disease (GERD) with an odds ratio [OR] of 2.36 (CI, 1.47–3.77; $P < .05$), more likely to have laryngomalacia with an OR of 2.98 (CI, 1.80–4.94; $P < .05$), more likely to have laryngeal anomalies with an OR of 2.32 (CI, 1.52–3.55; $P < .05$), and more likely to have obstructive sleep apnea (OSA) with an OR of 2.16 (CI, 1.35–3.45; $P < .05$). Mast cells were also evaluated as a continuous variable, and higher numbers of mast cells in the larynx correlated with increasing odds of GERD ($P < .05$), laryngomalacia ($P < .05$), and laryngeal anomalies ($P < .05$).

**Conclusion:** Mast cells are associated with inflammatory conditions, although little is known about their presence in laryngeal inflammation. The results from our study demonstrate an association between mast cells in the pediatric larynx with GERD, laryngomalacia, laryngeal anomalies, and OSA. Our study also showed that higher number of mast cells correlates with increased odds of GERD, laryngomalacia, and laryngeal anomalies indicating that these inflammatory conditions have an impact on the larynx that can be demonstrated cellularly.

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**The Association of Pediatric Laryngeal Eosinophils With Eosinophilic Esophagitis**

Emily L. Mace (Presenter); Shilin Zhao, PhD; Christopher T. Wootten, MD; Ryan H. Belcher, MD

**Introduction:** Eosinophils have previously been found in laryngeal biopsies; however, their significance and associated pathology have not been well studied as in the lungs and esophagus. This study evaluates the presence of eosinophils in
the pediatric larynx and its association with eosinophilic esophagitis (EoE).

**Method:** This study was approved by the Vanderbilt Institutional Review Board. During aerodigestive pediatric otolaryngology procedures between 2014 and 2019, biopsies of the supraglottic larynx were collected. Biopsies were reviewed by pathologists for the presence and number of eosinophils. A proportion of patients also underwent esophageal biopsy when medically indicated. The patients’ electronic health records were reviewed for relevant demographic data and clinical diagnoses present at the time of biopsy.

**Results:** A total of 464 patients were biopsied and assessed for eosinophils. Review of the specimens revealed 31 (6.7%) patients with eosinophils in their laryngeal biopsies. Of these patients, the median number of eosinophils per hpf was 1 with a standard deviation of 1.68. Patients with eosinophils in their biopsy had a significantly higher prevalence of eosinophilic esophagitis at 13%, compared with those without eosinophils, with a prevalence of 3% ($P = .009$). EoE patients with laryngeal eosinophils also had higher levels of eosinophils on esophageal biopsy, with a mean of 73 cells per hpf; in comparison, EoE patients without laryngeal eosinophils had a mean of 21 eosinophils on esophageal biopsy.

**Conclusion:** Despite the larynx being positioned directly between the esophagus and lungs, little is known about the pathologic and physiologic impact of eosinophils on the larynx. This study shows the presence of eosinophils in the larynx is associated with a higher prevalence of EoE and higher levels of eosinophils on esophageal biopsy in patients with EoE.

**Baseline Quality of Life in Children’s Head-and-Neck Low-Flow Vascular Malformations**

Sean S. Evans, MD (Presenter); Steven Goudy; Ching Siong Tey; Rachel Swerdlin; Matt Hawkins

**Introduction:** Low-flow head and neck vascular malformations (LFHNVM) are complex lesions with poorly understood sequelae in pediatric patients. This study’s purpose is to determine baseline quality-of-life (QOL) characteristics in patients with LFHNVM.

**Method:** Institutional Review Board approved this retrospective review of a prospectively maintained database including demographic data, lesion diagnosis, location, and extent. PedsQL™ scores were collected using parent proxy data for children 2 to 7 years old and both patient and parent proxy data for patients 8 years old.

**Results:** A total of 94 consecutive patients were included between 2016 and 2019, mean age of 9.2 $\pm$ 4.7 years. Diagnoses: lymphatic malformations (LM) = 50, venous malformations (VM) = 41, combined venolymphatic malformations (VLM) = 3. Parental overall QOL scores were lower than their child’s in psychological (PsFD), school (ScFD), and social functioning domains (SoFD; $P = .02$; $P = .04$; $P = .03$). Lower parental scores were also noted in ScFD for submandibular/sublingual and oropharyngeal involvement ($g = -0.68$, $P = .03$; $g = -0.83$, $P = .04$), physical (PhFD), and SoFD for hypopharyngeal (HP) involvement ($g = -1.10$, $P = .03$; $g = -1.40$, $P = .02$). SoFD for orbital involvement ($g = -0.87$, $P = .01$), PhFD, PsFD, and SoFD for increasing subsite number involvement ($-0.30$, $P = .01$; $-0.29$, $P = .03$; $-0.27$, $P = .03$), and ScFD for those who received prior treatment ($d = 0.59$, $P = .04$). Parent proxy-reported emotional function (EFD) scores decreased with increasing age at presentation ($-0.60$, $P < .01$), were higher in PhFD for VM vs LM ($d = -1.07$, $P = .01$) and lower in EFD for HP involvement ($g = -1.25$, $P = .05$). Child-reported scores in ScFD were lower in Black vs White children ($P = .04$); lower in PhFD, SoFD, and total domains with HP and laryngeal involvement ($g = -1.19$, $P = .04$; $g = -1.85$, $P < .01$; $g = -1.23$, $P = .04$); and lower in PhFD and SoFD and overall for increasing subsite involvement ($-0.32$, $P = .03$; $-0.38$, $P < .01$; $-0.35$, $P = .02$).

**Conclusion:** Parent and patient QOL scores are reduced across multiple domains for HNLFVM’s based on age, race, lesion lotion, disease burden, and prior treatment.

**Caregiver- and Child-Reported Quality of Life in Snoring Children**

Phoebe K. Yu, MD, MPH (Presenter); Jiayan Liu; Craig S. Derkay, MD; Susan Garetz; Stacey Ishman, MD, MPH; Cristina Baldassari, MD

**Introduction:** Caregivers report poor quality of life (QOL) in children with sleep-disordered breathing (SDB). The objective of this study is to assess the correlation between caregiver and child-reported QOL in children with SDB.

**Method:** In the Pediatric Adenotonsillectomy Trial for Snoring, healthy children with mild SDB (apnea-hypopnea index <3) were randomized to watchful waiting or adenotonsillectomy. At baseline, the validated Pediatric Quality of Life Inventory (PedsQL) with Total, Physical Health, and Psychosocial Health scores assessed global QOL in participating children 5 to 11 years old. We compared scores obtained from caregivers and participants and used multivariable regression to assess whether factors such as socioeconomic status, disease severity, and parenting style were associated with systematic deviations between parent and child report.

**Results:** PedsQL scores were available for 289 families. The mean age of children was 7.0 years, with 45% ($n = 132$) identifying as White. The mean total PedsQL score reported by parents was higher at 76.3 (indicating better QOL) than the mean child-reported score of 66.4 ($P < .001$). The correlation between parent and child total PedsQL scores was 0.04 for children 5 to 7 years old ($P = .56$) and 0.23 for children 8 to 11 years old ($P = .02$). Higher correlations were observed for psychosocial health scores compared with physical health scores. Increasing child age (estimate $−2.45$; CI, $−3.75$, $−1.14$) and permissive parenting style ($−3.72$; CI, $−7.10$, $−0.34$) were associated with a smaller difference between parent and child report.

**Conclusion:** Parent- and child-reported global QOL in school-aged children with mild SDB were weakly correlated. Further research is needed to assess whether similar trends are evident for disease-specific QOL metrics.
Characterization of Otolaryngologic Conditions in Children With Neonatal Abstinence Syndrome

Rita Wang (Presenter); Bita Naimi; Zaroug Jaleel; Jessi Levi, MD

Introduction: Literature on otolaryngologic sequelae of children with neonatal abstinence syndrome (NAS) has been scarce to date. Prior reports suggest some otologic conditions associated with long-term NAS outcomes, but no comprehensive exploration of these relationships currently exists. Our study aims to characterize the breadth of otolaryngologic conditions diagnosed in children with NAS.

Method: We conducted a retrospective descriptive study of 524 children with NAS and otolaryngologic diagnoses born from January 1, 2014, to December 31, 2019, and evaluated at an otolaryngologic clinic at a tertiary care hospital. Diagnoses were categorized as otologic, oropharyngeal, sinonasal, and laryngeal conditions. Additional diagnoses of obstructive sleep apnea (OSA), congenital abnormalities of the head and neck, and audiology consults were noted separately. Analysis of covariance testing was used to test differences in the mean number of diagnoses.

Results: A total of 680 otolaryngologic diagnoses were analyzed across 524 patients. Otologic conditions comprised 34.9% of diagnoses, oropharyngeal conditions 26.8%, sinonasal conditions 18.4%, laryngeal conditions 5.3%, OSA 1.5%, congenital abnormalities 8.4%, and audiology consults 4.9%. Adjusting for covariates, there were a significantly higher number of otologic diagnoses compared with the other subcategories with a mean (SD) of 0.46 (0.83), followed by oropharyngeal 0.35 (0.55), sinonasal 0.24 (0.49), and laryngeal 0.07 (0.29).

Conclusion: Understanding the otolaryngologic sequelae of children with NAS is important as these conditions affect children’s early development. Our results can help inform physicians in providing comprehensive pediatric care and management of patients born with NAS and guide further research in this field.

COVID-19 Impact on Operative Management of Pediatric Neck Abscesses

Mark A. Fadel, MD, JD (Presenter); Fendi Obuekwe; Jennifer L. McCoy, MA; Dennis Kitsko

Introduction: For multiple reasons, elective pediatric otolaryngology surgical procedures have declined during the COVID-19 pandemic. However, it is less clear how COVID-19 has affect acute care surgeries. The purpose of this study was to assess whether the prevalence of pediatric head or neck abscesses managed with operative drainage decreased compared with previous years.

Method: In a retrospective study, we evaluated medical records of 203 pediatric cases diagnosed with abscess of the head or neck and treated with incision and drainage at a large tertiary care children’s hospital between the dates of April 1 and November 30 from 2015 to 2020. We compared outcomes for each year from 2015 with 2019 with the same date range in 2020, which included location of the infection, abscess size, symptoms, duration of antibiotic treatment before and after operative intervention, microbiology, and the number of cases per year.

Results: The mean ± SD presenting age in the 2015–2019 group was 5.10 ± 5.10 years and 2.24 ± 1.91 years in the 2020 group. Neck abscesses were more common than head abscesses from 2015 to 2019 (81.7% vs 18.3%), whereas only neck abscesses presented in 2020 (P = .030). The mean number of cases between 2015 and 2019 was 36 ± 3.81, whereas the number of cases in 2020 was 23 (P = .036). The most common symptom was neck stiffness or swelling in both groups (2015–2019, 74.4% vs 2020, 100%, P = .003). Of those patients who underwent intravenous antibiotic therapy prior to presentation (n = 43), the mean number of days before admission was 1.98 ± 2.95 (n = 40) from 2015 to 2019 and 12.00 ± 10.39 (n = 3) in 2020 (P = .008). The percentage of cases with multiple strains cultured between 2015 and 2019 was 13.8% vs 18.2% in (P = .007).

Conclusion: There was a decrease in the number of operative head or neck abscesses in 2020 during the COVID-19 pandemic compared with the mean number per year from 2015 to 2019 within the same date range. COVID-19 mitigation strategies leading to reduced transmission of other viral and bacterial illnesses and a tendency toward prolonged medical management to avoid surgery during the pandemic are 2 possible reasons for this decrease.

Diagnostic Clues for Identification of Pediatric Foreign Body Aspirations

Brandon Truong (Presenter); Kimberly Luu, MD

Introduction: Foreign body aspiration (FBA) is a pediatric medical emergency that is often difficult to diagnose. Better understanding of its clinical presentation and workup may improve the diagnostic accuracy of FBA.

Method: We retrospectively reviewed clinical records of pediatric patients who presented to a tertiary care center with a potential diagnosis of FBA from 2010 to 2020. Demographic data, clinical history, physical examination, imaging, and bronchoscopy findings were collected.

Results: A total of 518 pediatric patients (mean age = 2.7 years) presented with suspicion of FBA. Of these, 390 (75.2%) sought treatment within 1 day of the inciting event, with 376 (72.5%) presenting initially to the emergency department. History findings indicative of FBA included wheeze (odds ratio [OR], 5.83; 95% CI, 3.65–9.30), respiratory distress (OR, 1.65; 95% CI, 1.02–2.66), and multiple encounters (OR, 5.46; 95% CI, 2.97–10.06). A supportive physical exam had a sensitivity of 60.8% and specificity of 88.4%. O2 saturation at presentation was found to be statistically lower in patients with FBA (97.3% vs 98.6%, P < .001). Chest radiographs were obtained in 74.1% of patients (n = 384) with a sensitivity of 45.3% and specificity of 88.0%. Some 25 low-dose computed tomography (CT) scans were performed with a
sensitivity of 100% and specificity of 85.7%. A total of 186 rigid bronchoscopies were performed, with 65.6% (n = 120) positive for FBA. Foreign bodies were more commonly found on the right (51.7%) than the left (38.3%), with few in the trachea or carina (9.1%); 80.8% consisted of organic material, predominantly nuts.

**Conclusion:** Accurate diagnosis of FBA requires careful history taking and examination. Observation of a lower O₂ saturation is suggestive of FBA. Chest radiographs have limited sensitivity; however, low-dose CT scans were highly sensitive and should be considered in the diagnostic algorithm for FBA.

### Does Tracheoesophageal Fistula Repair Alter Outcomes of Laryngeal Cleft Repair?

Ivanna Nebor, MD (Presenter); Orna Katz Kadosh, MD; Meredith E. Tabangin, MPH; Charles Myer, MD; Catherine Hart, MD; Alessandro de Alarcon, MD, MPH

**Introduction:** Tracheoesophageal fistula (TEF) and laryngeal cleft (LC) are rare congenital airway anomalies that can coexist in some patients. However, the surgery-specific success rate of LC repair in children with associated TEF has not been well described. The aim of the study is to determine if the history of prior TEF alters the LC repair outcomes.

**Method:** A retrospective review was conducted of patients with LC with and without TEF/EA repair between January 2001 and November 2020. Data collected and analyzed included demographics, LC type, and LC with TEF/EA timing of repairs. The inclusion criteria were children with LC type I-III and deep notch who had all completed data.

**Results:** A total of 381 patients with LC were treated at our hospital. Of these, 283 patients met the inclusion criteria and were divided into 2 groups: LC (n = 242, 85.5%) and LC+TEF (n = 41, 14.5%). Revision repair was required in 43 patients (15.1%) with 8 (2.8%) needing a second revision repair. The first LC revision rate in the LC group was 28 (14.9%) compared with 7/41 (17.1%) in LC+TEF (P = .72). The second LC revision rate in the LC and LC+TEF groups was 7 (29.9%) and 1 (2.4%), respectively. The median time to revision in the LC group was 5.1 (interquartile range [IQR]: 3.45, 10.6) months, as compared with the LC+TEF group, which was 29.2 months (4.8, 44.2; P = .07). The median time between the first and second revisions for the 7 patients in the LC group was 28.55 (IQR: 10.7, 53.6) months and 6.5 months in 1 patient from the LC+TEF group.

**Conclusion:** The incidence of TEF and LC was 14.5% in our study. Based on our findings, a history of TEF repair was not associated with a higher revision rate than patients with LC alone. The history of TEF repair did not alter the outcomes of LC repair. Parents and families can be counseled that their outcomes are similar to LC alone patients.

### Drug-Induced Sleep Endoscopy Findings in Obese Adolescents

Cristina Baldassari, MD (Presenter); Timothy Kearney

**Introduction:** Drug-induced sleep endoscopy (DISE) is increasingly used to assess upper airway collapse in pediatric obstructive sleep apnea (OSA) patients. Data regarding DISE findings in obese adolescents with OSA is lacking; such information could be used to direct treatment and improve outcomes as controversy exists as to whether adenotonsillectomy (AT) or positive airway pressure is the standard therapy for this population. Our primary objective is to describe DISE findings in obese adolescents. We also sought to assess whether DISE findings predicted OSA resolution following AT.

**Method:** A 10-year review was conducted at our tertiary children’s hospital of obese adolescents 12 to 21 years old with OSA (apnea-hypopnea index [AHI] ≥1) that underwent DISE prior to AT. All DISE procedures were scored using the modified VOTE classification.

**Results:** A total of 30 obese adolescents underwent pre-AT DISE and had both pre- and post-AT polysomnogram. The mean age of the adolescents was 14.6 (SD 2.7) years. Most patients had severe disease with a mean AHI of 36.5 (SD 29.5). The most common site of collapse noted on DISE was the oropharynx/lateral oropharyngeal walls, occurring in 93% (n = 28) of adolescents. Of the patients, 73% (n = 22) had multilevel obstruction. More than 50% of subjects had persistent OSA following AT. Although the site of collapse on DISE did not predict post-AT outcomes, adolescents with higher baseline AHI were more likely (odds ratio = 1.13; 95% CI, 1.01, 1.26) to have persistent OSA after AT.

**Conclusion:** The most common site of collapse on adolescent DISE is the oropharynx, which is amenable to surgical intervention. However, rates of persistent OSA following AT are high regardless of baseline DISE findings in obese adolescents. Future research is needed to assess if DISE-directed multilevel sleep surgery improves outcomes in this population.

### Dysphagia Outcomes Following Surgery for Pediatric UVFi: A Systematic Review

Kasley M. Marvin, MD (Presenter); Michael J. Coulter, MD; Tzyynong L. Friesen, MD; Kimberly Morris, CCC-SLP-BCS-S, IBCLC; Christopher M. Johnson, MD; Matthew T. Brigger, MD, MPH

**Introduction:** Dysphagia is a frequent symptom of unilateral vocal fold immobility, although the outcomes of dysphagia following intervention are not well described. The objective of this study is to assess dysphagia outcomes following surgical management of unilateral vocal fold immobility in children.

**Method:** A systematic review of the medical literature was performed following PRISMA guidelines. An a priori protocol was defined to identify all articles that presented quantifiable outcome data in children under the age of 18 years who underwent surgical treatment to improve glottal competence for dysphagia. Two authors independently determined which references met inclusion criteria, extracted data, and assigned levels of evidence. Data were pooled using a random effects model where possible. The quality of studies was graded using the MINORS criteria.

**Results:** A total of 398 publications were screened, with 9 meeting inclusion criteria. A total of 115 patients were
included. Of these, 77% (95% CI, 66%, 87%) had preoperative swallowing symptoms. Surgical intervention for dysphagia included 66 injection laryngoplasties, 11 type I thyroplasties, and 10 ansa cervicalis to recurrent laryngeal nerve reinervations. The articles consistently reported success in improving dysphagia symptoms, and limited pooling of the data demonstrated a mean improvement after surgical intervention in 79% (95% CI, 67%, 91%) of children. The reported rate of minor and major complications was 15% (95% CI: 1%, 29%). The MINORS criteria scores ranged from 5 to 12.

Conclusion: Surgical management of unilateral vocal fold immobility in properly selected children can be an important component of treating dysphagia when symptoms are present. The selection of surgical technique relies on both patient- and surgeon-related factors while providing a high rate of success in managing these complex children.

An Educational Pop-up Book Comforts and Empowers Children Before Surgery
Holly Cordray (Presenter); Chhaya Patel, MD; Kara K. Prickett, MD

Introduction: We evaluate a novel interactive pop-up book for pediatric preoperative education as a tool for managing anxiety and strengthening coping skills.

Method: A prospective randomized controlled trial of children ages 5 to 12 undergoing outpatient surgery was conducted from August to December 2020. Patients either read a pop-up book about general anesthesia (intervention) or received standard care (control). Patients self-reported their preoperative fear, expected pain, expectations and attitudes about the procedure, views of preoperative explanations, and coping strategies. Observer-rated anxiety and parent/caregiver satisfaction were also evaluated.

Results: A total of 151 patients enrolled, and 148 completed the study. Most patients (73.6%) had otolaryngology procedures. Pop-up book patients self-reported significantly less fear of anesthesia induction than standard-care patients, with a large effect size ($d = 0.95; P < .001$). Pop-up book patients expected less pain from the mask and the procedure, with medium-to-large effect sizes ($d = 0.61–0.79; P < .001$). The book facilitated more positive views of the procedure and of preoperative explanations, with medium-to-large effect sizes ($d = 0.58–1.20; P < .005$). Further, the book prepared patients to generate more adaptive coping strategies: greater proportions of patients reported positive active coping, distraction strategies, and support-seeking strategies ($P < .001$). However, observer-rated anxiety at anesthesia induction did not differ between groups ($P = .81$). Parents/caregivers were significantly more satisfied with their care if their child read the book ($P = .02$).

Conclusion: The pop-up book offers a child-focused resource for preoperative education that effectively alleviates children’s preoperative fears, encourages positive coping, and improves caregiver perceptions of the care experience.

The Efficacy and Safety of Eustachian Tube Balloon Dilation in Children: A Meta-analysis
Mohamed A. Aboueisha, MD (Presenter); John Carter, MD; Edward McCoul, MD

Introduction: We analyze the efficacy of Eustachian tube balloon dilation in children; determine the safety of Eustachian tube balloon dilation in children; and compare between Eustachian tube balloon dilation and ventilation tube insertion in children. This the first meta-analysis and systematic review addressing the use of Eustachian tube dilation in children including all the articles in the literature up to March 20.

Methods: Original studies of balloon dilation Eustachian tuboplasty (BDET) in a pediatric population were identified in PubMed, Embase, Web of Science, Cochrane, Clinicaltrials.gov, and CINAHL. Outcomes of efficacy included tympanogram and audiogram findings. Adverse events were summarized for each study.

Results: Seven articles were included involving 408 children with a mean age of 9.9 years old (95% CI, 8.8, 11.1) with a mean follow-up of 19.2 months (95% CI, 15, 23). Type B tympanograms decreased after BDET from 64.2% (95% CI, 53.3, 73.8) to 16.1% (95% CI, 8.5, 28.4). Air–bone gap (ABG) decreased after BDET from a mean of 25.3 dB (95% CI, 18.9, 31.6) to 10.2 dB (95% CI, 8.9, 11.5). The pooled estimate of adverse events after BDET was 5.1% (95% CI, 3.2, 8.1), with most being self-limited epistaxis with no major adverse events reported. Three studies compared BDET with ventilation tube insertion. Analysis of postoperative ABG showed it was lower in the BDET group (SMD −0.92 dB; 95% CI, −1.5, −0.35; $P = .002$).

Conclusion: Although data are limited, BDET ± tympanostomy tube placement may offer a surgical advantage over tympanostomy tube placement alone in the treatment of otitis media with effusion in the pediatric population. The procedure was safe with no major adverse events, with the most common complication being epistaxis.

Epidemiology of Pediatric Facial Lacerations
Erico Rego (Presenter); Nikita Patel; Sudeepthi Vedula; Christina H. Fang, MD; Christen Caloway, MD; Jean Anderson Eloy, MD

Introduction: Facial lacerations are the most common manifestation of pediatric facial trauma, but data on the epidemiology of pediatric lacerations are currently limited. The goal of this study is to evaluate the etiology and demographics of pediatric patients with facial lacerations.

Method: A retrospective analysis of the National Electronic Injury Surveillance System (NEISS) from the Consumer Product Surveillance System was performed. Cases of facial lacerations in pediatric patients between the ages of 1 month to 22 years from 2010 to 2019 were analyzed for primary diagnosis, patient demographics, and associated variables. Analyses of age groups were also performed: toddlers (age 0–4), children (age 5–12), teenagers (age 13–17), and young adults (age 18–21).
Evaluating the Impact of Health Disparities in Pediatric Thyroidectomy

Jesse Sanchez (Presenter); Beth Osterbauer; Daniel Kwon

Introduction: Health disparity is an area of increasing focus within the field of pediatric otolaryngology, with some studies describing worsened perioperative complications, burden of disease, and worsened outcomes in certain social and demographic groups. This is the first study to examine the impact of social, demographic, and economic factors in pediatric thyroidectomy.

Method: We retrospectively reviewed 228 patients identified with complete records from the thyroidectomy registry at the Children’s Hospital of Los Angeles, a tertiary center that serves a wide range of patients referred from all over Southern California, between 2010 and 2020. Data collected from the medical records included ethnicity, primary language, insurance type, zip code, and other demographic information. Disease and treatment outcome data were analyzed with chi-square, Fisher exact test, and multivariable logistic regression.

Results: Based on preliminary data, we found that that 71% of our patients had public insurance. A larger percentage of those with public insurance were Spanish speakers (48% vs 4%, P < .001) and had shorter mean postoperative stays in the hospital (1.9 vs 3.2 days, P = .04). While not reaching statistical significance, children with public insurance tended to be younger (15.9 vs 14 years) and Hispanic (50% vs 31%). We found no differences in disease pathology, rates of perioperative complications such as nerve injury, or rates of postoperative complications such as hypocalcemia with respect to insurance type, ethnicity, or primary language. Additional geographic and socioeconomic analyses are pending.

Conclusion: While it is important to note that commonly reported outcome measures likely fall short in describing the impact and burden of disease in different groups, our findings suggest that safety net insurance systems that provide access to high-volume tertiary care centers can serve as an “equalizing factor” in children undergoing thyroidectomy. In addition, our results would refute the notion that lower socioeconomic pediatric populations have a greater burden and or severity of thyroid disease.

Identification of Proteins for Epithelialization & Vascularization in Decellularized Tracheal Grafts

Riddhima Agarwal, MS (Presenter); Tendy Chiang, MD; Lumei Liu, PhD; Sayali Dharmadhikari, MS

Introduction: We describe challenges faced by otolaryngologists in the reconstruction of long-segment tracheal defects; compare the advantages and disadvantages of currently available scaffolds for tissue-engineered tracheas; and compare the intracellular proteome profiles of syngeneic vs decellularized tissue-engineered tracheal grafts. This is a late-breaking abstract because additional time was needed to reach the 3-month endpoint of animal studies and complete subsequent mass spectrometry of postimplant tissue-engineered tracheal grafts.

Methods: Syngeneic tracheal grafts (STG) and sodium dodecyl sulfate-decellularized trachea (DTS) were orthotopically implanted in C57BL6 mice. Grafts (n = 3/group) explanted at 3 months and preimplant scaffolds (n = 4/group) were analyzed via mass spectrometry. Scaffold-5 Proteome Software and statistical analysis were used to identify polypeptides that function in epithelial and endothelial cell regeneration.

Results: Total numbers of proteins involved in epithelialization and vascularization were decreased in preimplant DTS and STG but recovered following implantation. The 4 most prevalent proteins involved in these processes were identical in postimplant DTS and STG. Amongst these, fatty acid synthase and vinculin had roles in both functions. Filamin-B, Ras GTPase-activating like protein, and laminin were involved only in epithelialization. Myosin-9, myoferlin, and complement C3 have roles in vascularization.

Conclusion: Our study shows that DTS grafts recapitulate the proteomic profile of STG grafts in terms of key intracellular pathways of regeneration, thus supporting their translational appeal.

The Impact of a Fast Track Questionnaire in Pediatric PVFMD

Erin Harvey (Presenter); Eileen Peterson; David Beste; Rachel Fee; Thomas Robey

Introduction: Paradoxil vocal fold motion disorder (PVFMD) can be a frequent cause of dyspnea in an otherwise healthy adolescent population. The current standard of care, when the diagnosis is suspected, includes referral to an otolaryngologist (ENT) prior to beginning laryngeal control therapy (LCT) with a speech-language pathologist (Scalp). We hypothesize that a “fast-track” screening questionnaire will improve time to treatment as well as decrease patient billing charges.

Method: A total of 258 patients (group 1, G1) who received traditional referral (TR) and were evaluated by ENT and Scalp in a pediatric voice clinic with a diagnosis of PVFMD between November 2013 and November 2017 were identified and evaluated.
compared with 66 patients (group 2, G2) from October 2018 to November 2019 who were prospectively reviewed and fast-tracked (FT) for LCT through a designed screening questionnaire.

**Results:** The number of female patients (81% G1, 82% G2, \( P > .05 \)) and median age (G1: 14 years interquartile range [IQR] 4, G2: 14 years IQR 3, \( P = .83 \)) were similar between the 2 groups. The median duration from symptom onset to Scalp referral was significantly shorter for the FT group (G1: 12 months, IQR 16; G2 8.5 months IQR 8, \( P = .02 \)). The interval time from referral to provider visit was also significantly lower in the FT group: 4 weeks (IQR 3.5) in G1 (ENT visit) vs 3 weeks (IQR 3) in G2 (Scalp visit) (\( P = .05 \)). More than half of the patients in G1, as well as G2, did not request additional LCT sessions with the Scalp after their initial voice clinic diagnosis and treatment (G1) or FT Scalp appointment (G2) (71% and 72%, respectively). The typical minimum patient charge for a respiratory specialist and voice clinic PVFMD evaluation in group 1 was $5123 vs $1649 for the FT patients in G2, thus an average savings of more than $3000 per patient.

**Conclusion:** Using an FT screening questionnaire for pediatric PVFMD patients significantly helps decrease the time to treatment as well as patient charges without altering the response rate of LCT.

**Impact of Language and Ethnicity on Pediatric Tracheostomy Outcomes**
Nathan Garza (Presenter); Stephen Chorney; Yann-Fuu Kou; Romaine F. Johnson, MD, MPH

**Introduction:** Pediatric tracheostomy is associated with high health care costs and utilization. There is some evidence that these measures are affected by social determinants of health. Considering the complexity of pediatric tracheostomy care, understanding how language barriers may affect outcomes is important.

**Method:** We performed a retrospective case series of pediatric tracheostomy from 2009 to 2019. Children <18 years were included and divided by language and ethnicity. Tracheostomy outcomes were determined during the index hospital stay and subsequent visits until decannulation, aging out at 21 years old, or death. We used analysis of variance and the Pearson chi-squared test to determine statistically significant differences between the study groups.

**Results:** This study included 395 patients. Of these, 54 (14%) self-identified Spanish as their primary language, and 137 (35%) identified as Hispanic. Hispanic patients were older at the time of tracheostomy (9.3 vs 6.3 months, \( P = .02 \)) and less likely to be premature (35% vs 50%, \( P = .007 \)). Other risk factors were similar (\( P > .05 \)). Perioperative outcomes were also similar including indications (most common was respiratory failure = 61%, \( P = .16 \)), complications (7.3% vs 5.6%, \( P = .64 \)), length of stay after tracheostomy (mean = 107 days, \( P = .16 \)), and 30-day readmissions after index discharge (18% vs 22%, \( P = .16 \)). Long-term outcomes were also similar: decannulation rate (26% vs 32%, \( P = .55 \)), time to decannulation (chi-squared = 0.99, \( P = .32 \)), and mortality (22% vs 17%, \( P = .26 \)) were no different between language and ethnicity groups.

**Conclusion:** Language and ethnicity appear to have minimal impact on pediatric tracheostomy outcomes.

**Lingual Tonsillectomy Outcomes in the Pediatric Population**
Vincent R. Morrow (Presenter); Adrian Williamson, MD; Michele M. Carr, MD, DDS, Med, PhD; Steven W. Coutras, MD, FRACS

**Introduction:** Lingual tonsillectomy (LT) can be offered to treat obstructive sleep apnea in children; however, there are few previous studies that describe the outcomes and complications of this procedure. The goal of this study is to describe the postoperative outcomes and complications following LT.

**Method:** A retrospective review of pediatric patients who underwent LT was performed from January 1, 2013, to January 1, 2021. LT was completed using coblation in all patients. Only patients less than 18 years of age at the time of the procedure were included. Data collected included age, gender, body mass index z score, medical and surgical history, length of stay, and any postoperative complications that were identified. All statistical analyses were performed using R (version 4.0.3).

**Results:** A total of 175 patients were included in the study: 99 (56.6%) were male and 76 (43.4%) were female. The mean age was 8.27 years (95% CI, 7.75–8.79 years). Of note, 10 (5.71%) patients had a diagnosis of trisomy 21, 57 (32.57%) patients had a diagnosis of developmental delay, and 31 (17.71%) patients had a history of seizures or epilepsy. The mean apnea-hypopnea index for the group was 7.84 (95% CI, 5.81–9.86), and the mean oxygen nadir was 87.14% (95% CI, 86.08–88.20%). The mean postoperative length of stay was 1.05 days (95% CI, 1.00–1.10 days). Complications were seen in 26 (14.86%) patients and ranged from prolonged dysphagia (2 patients, 1.14%), poor oral intake requiring an emergency department visit or readmission (14 patients, 8.00%), postoperative bleeding requiring observation alone (5 patients, 2.86%), and postoperative bleeding requiring operative intervention (7 patients, 4.00%).

**Conclusion:** LT is a safe procedure for the pediatric population. Postoperative bleeding and need for readmission or ED visit for poor PO intake or pain control was rare.

**Locked Down, Not Left Out: Unplanned Telepractice Amid COVID!**
Vidhu Sharma, MS, ENT (Presenter); Kapil Soni; Amit Goyal

**Introduction:** The current COVID-19 pandemic has posed unforeseen challenges, including sudden loss of or limited access to health care services. One subgroup of individuals affected are the prelingual hearing-impaired children who need regular auditory verbal therapy (AVT). We share our experience of conducting unplanned remote telepractice for such children in a resource-constrained setting—the challenges faced and the barriers overcome.
Method: The study was conducted at a tertiary care center in northwestern India. A total of 21 prelingual hearing-impaired pediatric cochlear implantees were enrolled after taking informed teleconsent from the parents/caregiver, commencing from the period of nationwide lockdown. Telepractice sessions were conducted by the parent under the supervision of the speech-language pathologist (Scalp) via video calls (or audio calls) employing home-based activities. At the end of 6 weeks, the Scalp administered a questionnaire via phone calls to ascertain the feedback and overall experience of the parents with telepractice, and their responses were compiled. Also, after 6 months of telepractice, the performance of the children was assessed using PS score, Infant-Toddler Meaningful Auditory Integration Scale score, and Speech Intelligibility Rating score. These were compared with baseline pre-teletherapy scores.

Results: The mean age of children was 5.8 years (2–13 years); 10 were male and 11 female. A majority of parents had a positive experience in terms of a better understanding of their child’s learning challenges (90%), overall satisfaction level as ≥3 (90%), and willingness to recommend telepractice to others and feasibility (57%). Post-teletherapy performance scores showed satisfactory improvement.

Conclusion: Implementing unplanned telepractice posed a variety of challenges. The sudden switch over from office-based therapy to telepractice posed difficulties for not only the child and parent but for the Scalp as well. The challenges we faced necessitated out-of-the-box thinking on a situation-to-situation basis, yielding encouraging opportunities and overall encouraging results.

Mechanical Ventilation and Middle Ear Effusions Among Tracheostomy-Dependent Children

Erin M. Wynings, MD (Presenter); Stephen R. Chorney, MD, MPH; Hussein Jaffal, MD; Rachel St. John, MD; Romaine F. Johnson, MD, MPH

Introduction: The natural history of middle ear effusions (MEE) in tracheostomy-dependent children requiring ventilatory support is not well described.

Method: A retrospective cohort study analyzed all children less than 2 years of age having a tracheostomy placed at a tertiary center between 2015 and 2020. Children with at least 1 documented tympanometry examination were included. Primary outcomes were rates of MEE, defined as a flat tympanogram with normal external canal volume, among children requiring or not requiring mechanical ventilation in the first 24 months after tracheostomy.

Results: A total of 94 children were included. The median age at tracheostomy was 4.6 months (interquartile range [IQR]: 2.9–6.2), 67% (63/94) were born before 37 weeks gestation, and 18% (17/94) had a craniofacial syndrome or trisomy 21 diagnosis. Each child obtained a median of 2 tympanometry exams (IQR: 1-3) during a period of 14.1 months (IQR 6.6–27.8) of follow-up after tracheostomy placement. Children on mechanical ventilation at the time of tympanometry were more likely to have MEE (odds ratio [OR]: 2.7; 95% CI, 1.4–5.2; P = .001). Within 24 months after tracheostomy placement, 82% of children on mechanical ventilation developed MEE compared with 45% of children not on mechanical ventilation (hazard ratio: 2.9; 95% CI, 1.5–5.7, P = .001). An MEE that persisted on at least 2 consecutive exams was not statistically more common for children who were on a ventilator (OR: 2.9; 95% CI, 0.6–12.8, P = .10). When controlling for age at exam, gestational age, craniofacial syndrome, and trisomy 21 diagnosis on logistic regression, ventilator dependence significantly predicted the presence of MEE (OR: 2.5; 95% CI, 1.3–4.8, P = .006).

Conclusion: Children with a tracheostomy are more likely to develop MEE if they require mechanical ventilation. Clinicians should recognize this risk factor and appropriately assess candidacy for tympanostomy tube placement.

Medical Therapy +/- Sinus Surgery for CF Exacerbations: Crossover Analysis

Drew H. Smith, MD, MS (Presenter); Jeffrey Falco, MD (Presenter); Thomas W. Holmes, MD; Brian Shirley, PNP-BC; John D. Prosser, MD

Introduction: Cystic fibrosis (CF) leads to chronic rhinosinusitis (CRS). This crossover analysis investigates any potential differences in pulmonary function outcomes among CF patients receiving both medical management (MM) and functional endoscopic sinus surgery (FESS) vs MM alone for CF exacerbation.

Method: The data were prospectively collected. Diagnosis of CF and age ≤18 years were required. Pulmonary function test (PFT) values were obtained from July 2011 to March 2020. All patients were hospitalized and treated for CF exacerbations with MM with FESS or MM alone. For crossover analysis, data from patients who had FESS with MM initially or MM alone initially were selected in an alternating fashion. Two-way analysis of variance with repeated measures was used to determine the effect of receiving FESS with MM vs MM alone on PFT outcomes (forced expiratory volume in 1 second; FEV1) over time (during admission, at discharge, at 3 months, at 6 months, and at 12 months). A P value less than .05 was considered significant.

Results: Thirteen patients, 7 of whom had FESS with MM initially and 6 of whom had MM alone initially, and 20 events of both FESS and MM were included for analysis. For PFT outcomes, there was no statistically significant 2-way interaction between treatment type and time (P = .492). In addition, the main effect of treatment did not show a statistically significant difference in FEV1 between trials (P = .737). Irrespective of treatment, there was a statistically significant increase in FEV1 of 12.60 (95% CI, 1.91 to 23.29) from prehospitalization to discharge (P = .014). There was also a statistically significant increase in FEV1 from prehospitalization to 6 months posthospitalization of 9.40 (95% CI, 0.99 to 17.81; P = .021). There was no statistically significant association between treatment type and hospital readmission at 6 months (P = .270) or at 12 months (P = .265).
**Conclusion:** There was no significant difference between PFT outcomes in pediatric patients hospitalized for CF exacerbation treated with MM with or without FESS at any time interval. There was no association between hospital readmission at 6 months or at 12 months and treatment of FESS with MM or MM alone.

**Olfactory Testing to Improve COVID-19 Screening in School Children**

Kaitlyn Tholen, MD (Presenter); Sarah Gitomer, MD; Jill Kaar, MD; Brian Herrmann, MD; Daniel Beswick, MD; Maxene Meier, MD

**Introduction:** We analyze olfactory changes in the pediatric SARS-CoV-2 population and compare with results in adults to determine if chemosensory screening may uniquely identify early infection; establish a screening tool for objective evaluation of olfaction in pediatric COVID-19 patients; and recognize the discrepancy between objective and patient-reported olfactory function in pediatric patients. This project includes significant new data since the initial submission date that strengthened our research amid the evolving COVID-19 pandemic. Our study analyzes smell disturbances in children during the COVID-19 pandemic in a largely asymptomatic cohort, which makes it unique compared with some recent studies. This project positively contributes to the olfactory research for pediatric COVID infections and demonstrates both COVID-19-related olfactory changes (ie, good smells are noxious) and children’s discrepancies in self-reported vs objective sense of smell.

**Methods:** Children aged 5 to 21 years undergoing SARS-CoV2 polymerase chain reaction testing for preoperative screening for nonrespiratory illnesses at a tertiary pediatric hospital were enrolled from June 2020 to April 2021 and were administered subjective questionnaires and a 40-question Smell Identification Test (SIT) within 2 weeks of COVID testing. Patients with prior history of olfactory dysfunction were excluded. Data were summarized with descriptive statistics.

**Results:** In total, 47 patients completed SIT testing (19 positive [40%] and 28 negative [60%] for COVID; mean age = 12.0 years; 63% female). There was no significant difference in overall SIT score or individual question responses between positive and negative patients, but 44% reported that certain foods smelled noxious. Overall, 26 patients (55%) were normosmic yet 44 (94%) denied subjective change in their sense of smell or taste.

**Conclusion:** There was no statistical difference in olfactory function between otherwise asymptomatic COVID-positive and negative children. Our findings suggest a discrepancy between objective and patient-reported olfactory function in pediatric patients.

**Pediatric Cystic Fibrosis Utilizing SNOT-22 and PFTs: A Demographic Study**

Thomas W. Holmes, MD (Presenter); Brian Shirley, PNP-BC; John D. Prosser, MD

**Introduction:** While the presence of chronic rhinosinusitis has been well established in the pediatric cystic fibrosis population, the role that demographics play in the disease has not been well described. A better understanding of any possible disparities would be an important factor to take into account while treating this patient population.

**Method:** This retrospective review was completed at a tertiary-referral academic pediatric otolaryngology practice. Patients with cystic fibrosis and age less than or equal to 18 years were included. Sinonasal Outcome Test–22 (SNOT-22) and pulmonary function test values were obtained as available at each visit to the multidisciplinary pediatric cystic fibrosis clinic from February 22, 2019, to March 10, 2020. Demographics including age, race, gender, and genotype were collected. Patients were then classified based upon demographics.

**Results:** A total of 413 SNOT-22 scores were obtained from the 102 patients over the course of the study. While SNOT-22 scores were similar, the average forced expiratory volume in 1 second (FEV1) value for patients of color was 72.7% compared with 88.0% for White patients ($P = .018$). Patients aged 0 to 4 years had the lowest average SNOT-22 score at 8.22 when compared with the age groups 5 to 12 years (SNOT-22 average 10.7) and 13 to 18 years (SNOT-22 average 12.7). There was no difference in subjective and objective findings when comparing gender and genotype.

**Conclusion:** Patients of color had statistically worse pulmonary function based on FEV1 values when compared with Caucasian patients. However, a minority of patients had similar subjective quality-of-life findings based on SNOT-22 scores.

**Pediatric Endoscopic Sinus Surgery: Analysis of Practice Patterns and Complications**

Sydnie Thomas (Presenter); Guodong Liu, PhD; Meghan N. Wilson, MD

**Introduction:** Large-scale studies of endoscopic sinus surgery (ESS) in the pediatric population are lacking. This study aims to evaluate pediatric ESS practice patterns in the United States and determine associations between demographics, comorbidities, procedures performed, and 30-day complication rates.

**Method:** This investigation used the Marketscan database. Patients in the United States under the age of 18 years who underwent ESS during 2016 to 2018 were identified. Data regarding cohort demographics, surgical procedure, and 30-day postoperative events (inpatient stay, complications, emergency department [ED] visits, readmissions) was collected. Univariate and multivariate analyses were performed to analyze results.

**Results:** The database included 2981 patients who met criteria for inclusion. ESS was performed on an outpatient basis in 94.5%. Children were split into 3 age groups for analysis: age <8 years (n = 511), age 8 to 12 years (n = 707), and age 13 to 18 years (n = 1763). Only 2.6% had a balloon sinuplasty as part of their surgery. Multivariate linear regression showed
that children 8 years and older were significantly ($P < .05$) more likely to have more extensive sinus surgery performed as were children with allergic rhinitis (odds ratio [OR] 1.3) and cystic fibrosis (OR 2.0). Adenoidectomy was performed in 25.7% of patients, with those <8 years statistically more likely to have adenoidectomy. A total of 19.4% had a complication, ED visit, or readmission postoperatively, with patients having a diagnosis of asthma, cystic fibrosis, and immunodeficiency having higher rates ($P < .05$). Those older (13 years and older) and with a history of immunodeficiency were less likely to have a complication or readmission ($P < .05$).

**Conclusion:** Personalized TT design is a feasible tool for physicians treating patients with M. Further studies are needed before widespread application of this technology in clinical settings.

### Personalized Virtual Tracheotomy-Tube Design in Pediatric Congenital Airway Malformations

**Sean S. Evans, MD (Presenter); Julianna Bonilla-Velez**

**Introduction:** Congenital airway malformations (M) are rare anatomic variants that can be life-threatening in children. The highly variable disease spectrum prevents standard care protocols. Virtual modeling is a novel technology for personalized medical solutions when conventional strategies fail.

**Method:** This is a feasibility study demonstrating the use of personalized virtual modeled tracheostomy tubes (TT) for pediatric patients (0–18 years) with M in a tertiary pediatric hospital. Patients had respiratory complications from intraluminal mispositioning leading to TT obstruction that did not improve despite multiple iterations of standard and custom-length and/or -shape TT trials. The process included airway computed tomography acquisition with virtual 3-dimensional airway reconstruction and TT modeling with triplanar customization and refinement. Models were transferred to Bivona Corporation for TT fabrication using industry-standard materials and processes. Serial tracheoscopies to assess position were performed. Retrospective chart review of 5 patients managed with personalized TT was completed. Outcomes included visualized resolution of granulation/ulceration and frequency of TT-related tracheoscopies before and after personalized TT placement.

**Results:** Three patients with M and recurrent TT-related respiratory complications were managed with personalized TT. All patients demonstrated resolution of visualized TT-related obstructive granulation and ulceration on serial endoscopies. All patients underwent less frequent tracheoscopies (interval between procedures increased from an average of 4.9 to 22.4 days, 50 to 180 days, and 11 to 16 days for each of these patients, respectively). One patient had de-escalation to a discharge-appropriate ventilator following implementation. Two additional patients were managed prophylactically and suffered no TT-related complications (no urgent tracheoscopies required).

**Conclusion:** Personalized TT design is a feasible tool for physicians treating patients with M. Further studies are needed before widespread application of this technology in clinical settings.

### Profound OSA Among Children With Sleep Disordered Breathing

Alexander Hansen (Presenter); Christopher Liu; Katie Liu; Jorena Lim; Romaine F. Johnson, MD, MPH

**Introduction:** We aim to determine if a polysomnography (PSG)-defined condition, profound obstructive sleep apnea (OSA; apnea-hypopnea index [AHI] >50), can be used to stratify the patient’s disease severity; and to determine risk factors for profound OSA (AHI >50) among children <18 years old and the risk of perioperative complications.

**Method:** We conducted a retrospective analysis of children <8 years of age with PSG-confirmed severe OSA (AHI >10) from January 2019 to December 2019. We divided patients into severe (AHI 10–50) and profound OSA (AHI >50). AHI >50 is considered profound OSA to stratify disease severity and the need for urgent evaluation and treatment. We collected demographic, clinical, and perioperative data, including respiratory events and readmissions. We determined the odds ratio for having profound OSA using logistic regression and the risk of perioperative complications.

**Results:** A total of 451 children had severe OSA, and 13.5% had profound OSA. The median age was 5.6 years, with 272 (60%) males. There were 14 (3.1%) Asian, 118 (26%) Black, 78 (17%) White, and 225 (49%) Hispanic patients. The mean AHI was 20.8 for the severe group and 80.5 for the profound group.

Children with profound OSA were older (7.9 vs 6.3 years, $P < .001$), had a higher body mass index (BMI; 26.3 vs 21.2, $P < .001$), had more respiratory complications after tonsillectomy (28% vs 12%, $P < .001$), and longer length of stays (1.5 vs 1.2 days, $P = .02$). BMI was the principal risk factor for profound OSA (odds ratio [OR] = 1.05; 95% CI, 1.03 to 1.07, $P < .001$). The predicted probability of profound OSA was 10% for the 50th (BMI = 18), 28% for the 95th (BMI = 37), and 45% for the 99th percentile (BMI = 49).

Children with profound OSA were 3 times more likely to have respiratory complications after tonsillectomy (OR = 3.03; 95% CI, 1.57–5.83, $P = .001$).

**Conclusion:** Profound OSA in children is associated with increasing BMI. Children with profound OSA also had more perioperative complications. These data support the continued routine use of PSG among obese children.

### Prophylactic Inhaled Corticosteroids for the Management of Recurrent Croup

Lauren E. Sowa, MD (Presenter); Christian Francom, MD; Jeremy Prager, MD; Paul Stillwell, MD; Paul Houin, MD; Sarah Gitomer, MD

**Introduction:** Croup is characterized by a barky cough, inspiratory stridor, hoarseness, and varying degrees of respiratory
distress. Acute croup episodes are often treated with oral or intravenous corticosteroids. Recurrent croup is defined as more than 2 to 3 episodes of acute croup in the same patient and often mimics reactive airway disease. We hypothesized that inhaled corticosteroids given at the first respiratory viral prodrome can lower the number and severity of recurrent croup episodes in children without fixed airway lesions.

**Method:** A retrospective chart review over an 18-month period was performed at a large tertiary care pediatric hospital following Institutional Review Board approval. Eligible patients younger than 18 years who were referred to either pediatric pulmonology or pediatric otolaryngology for recurrent croup were identified. Information regarding demographics, the number and severity of episodes both pre- and postintervention, medical history, workup, bronchoscopy results, treatment modalities, and clinical improvement were included in the analysis. A Fisher 2-tailed exact test was used to compare the number of croup episodes against the level of improvement.

**Results:** A total of 76 patients were included in our analysis; 60 male and 19 female with a mean age of 5.2 years. Of these, 42 had >5 episodes of croup, 27 had 3 to 5 episodes, and 4 had 2 episodes prior to intervention. Diagnostic laryngoscopy/bronchoscopy was performed in 17 patients (22%), with 65% showing a normal exam without fixed lesions. Some 49 patients (67%) were treated with inhaled steroids, 12 of whom were lost to follow-up. Of the remaining 37, 89% saw improvement with reduced severity and overall number of episodes of croup. In addition, patients with >5 episodes of croup (26) as compared with ≤5 (11) were more likely to improve with inhaled steroids, with a P of .07.

**Conclusion:** The novel use of inhaled corticosteroids showed promise as a preventative treatment to mitigate the severity and frequency of recurrent croup episodes.

**Risk Factors for Subglottic Stenosis Following Respiratory Syncytial Virus Hospitalization**

Tariq A. Salem (Presenter); Gresham Richter, MD; Elijah Bolin; James R. Gardner, MD; Isabella Zaniletti

**Introduction:** Respiratory syncytial virus (RSV) is a major cause of hospitalization in the pediatric population potentially using subglottic stenosis (SS). We sought to identify patient-specific characteristics for the development of SS following hospitalization for RSV bronchiolitis.

**Method:** We performed a multicenter retrospective cohort study using the Pediatric Health Information System for admissions from January 2008 to December 2019. Children <3 years old with bronchiolitis and RSV were included. All patients with a history of prematurity were excluded. The primary outcome was the development of SS. To determine factors associated with the outcome of interest, we performed multivariate logistic regression; covariates in the model were gastroesophageal reflux disease (GERD), bronchopulmonary dysplasia (BPD), congenital heart disease (CHD), associated airway anomalies, sepsis, pneumonia, length of stay, and airway interventions (laryngoscopy with dilation, microlaryngoscopy, and laryngotracheoplasty). Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were calculated for each.

**Results:** There were 185,309 patients in the final analytic sample, of which 15,454 (8.3%) subsequently developed SS. The incidence of SS following a hospitalization for RSV bronchiolitis is 3045 per year. Of the patients who developed SS, there were 382 subsequent encounters for endoscopy with balloon dilation and 74 encounters for laryngotracheoplasty. When holding other selected variables constant, factors associated with SS were GERD (aOR = 3.9; 95% CI, [3.3,4.6]), BPD (aOR = 6.0; 95% CI, [4.9,7.3]), CHD (aOR = 1.8; 95% CI, [1.5,2.0]), and associated airway anomalies (aOR = 19.8; 95% CI, [16.2,24.1]). Children with a diagnosis of sepsis (aOR = 0.5; 95% CI, [0.4,0.7]) or pneumonia (aOR = 0.2; 95% CI, [0.1,0.3]) were less likely to develop SS.

**Conclusion:** GERD, BPD, CHD, and associated airway anomalies are risk factors for the development of subglottic stenosis in children younger than 3 years of age after admission for RSV bronchiolitis. Sepsis and pneumonia were not associated with an increased likelihood of SS.

**The Safety and Efficacy of Pediatric Open Bedside Tracheostomy**

Ory Madgar (Presenter); Reut Kassif Lerner; Stav Devons-Sberro; Noa Rozendorn; Eran Alon; Eldar Carmel

**Introduction:** Traditionally, pediatric tracheostomy has been viewed as a technically demanding procedure with a high complication rate, requiring the routine use of a formal operating room. Pediatric bedside tracheostomy in an intensive care unit (ICU) setting has not been widely reported, in contrast to the widespread adult bedside ICU tracheostomy. Transport of these critically ill, multiple life support systems-dependent patients can be technically difficult, labor intensive, and potentially risky for these patients. The aim of our study was to demonstrate the safety and efficacy of performing a bedside tracheostomy in the pediatric ICU.

**Method:** We performed a retrospective analysis of all pediatric patients undergoing tracheostomy at a tertiary care center, between January 1, 2013, and December 31, 2019. Intraoperative and postoperative complications were compared between the 2 groups.

**Results:** During the study period, 117 pediatric patients underwent tracheostomy, 57 (48.7%) were performed bedside while 60 (51.3%) were performed in the operating room. Patients’ age ranged from 2 weeks to 17 years of age, with a median age of 16 months. No case of bedside tracheostomy necessitated a shift to the operating room. There was no difference in 30-day morbidity (P = .42) or mortality (P = .49) between the 2 groups.

**Conclusion:** As our results suggest, pediatric open bedside tracheostomy in an ICU setting is a safe and efficient procedure.
Seasonal Analysis of Pediatric Single-Stage Laryngotraheoplasty

Colin W. Fuller, MD (Presenter); James R. Gardner, MD; Courtney Wright; Deanne King, MD, PhD; Gresham Richter, MD; Andre Wineland

Introduction: Single-stage laryngotraheoplasty (ssLTP) is an important surgical option in the management of subglottic stenosis. Some surgeons prefer to avoid performing this procedure during peak cold and flu season. This retrospective study analyzes the impact of season on pediatric ssLTP surgical outcomes.

Method: Billing records were analyzed to identify primary ssLTPs performed at our institution in children (<18 years) from January 2004 through April 2020. Demographic and operative details including sex, age, preexisting tracheostomy, and level(s) of stenosis were captured via chart review. Patients were divided into 2 groups: those who underwent surgery during viral season (October to March, inclusive [VS+]) and those who underwent ssLTP at other times (VS−). Outcomes included duration of intubation, duration of intensive care unit (ICU) stay, and complications including need for reintubation, need for subsequent tracheostomy, contraction of RSV, and others. A 1-tailed noninferiority trial using chi-square and t tests was performed, as well as post hoc 2-tailed versions of these tests. The threshold for statistical significance was P < .05.

Results: A total of 34 ssLTPs were identified, 26 VS+ ssLTPs and 8 VS− ssLTPs. One patient underwent simultaneous tracheal resection with ssLTP. Some 31 patients had subglottic stenosis; of the remainder, 3 had isolated tracheal stenosis, 1 had isolated glottic stenosis. Demographics between the 2 groups were similar with regard to age, gender, tracheostomy status, and level of stenosis. VS+ ssLTPs had fewer mean ICU days (14.5 to 25.7) and intubated days (8.6 to 12.1) than VS− ssLTPs did. VS+ ssLTPs were less likely to suffer 1 or more complications (15/26 vs 6/8), including subsequent tracheostomy (4/26 vs 3/8). One- and 2-tailed tests of each variable demonstrated P > .05.

Conclusion: This single-institution study demonstrates non-inferior outcomes of ssLTR during from October to March. In fact, VS+ ssLTPs had better outcomes in each comparison, although no difference achieved statistical significance. Variation in the institutional burden of viral illness may affect these findings.

Smell Status in Children Infected with SARS-CoV-2

Zhanna Mokoyan, MD (Presenter); Irina Meytel; Anna Babayan; Ulyana Malayavina; Yury Rusetsky

Introduction: This study aimed to evaluate the olfactory status in children with laboratory-confirmed SARS-CoV-2 using subjective and psychophysical methods.

Method: This is a prospective clinical cross-sectional study of 79 children aged 5 years and older with SARS-CoV-2 infections confirmed by reverse-transcription polymerase chain reaction-based testing. All children were hospitalized at the National Medical Research Center for Children’s Health (Moscow, Russia) in April and May 2020. The 21st item of the Sinonasal Outcome Test–22 questionnaire and odor identification test were used for smell assessment. Children were examined twice during the hospitalization, and a telephone survey was conducted 60 days after hospital discharge.

Results: Immediately after confirmation of COVID-19, smell impairment was detected in 86.1% of children by means of the identification test and in 68.4% of children by means of the survey (P = .010). After 5 days, the survey revealed a statistically significant decrease in the number of patients with hyposmia (41 of 79, 51.9%). On the first visit, the mean identification test score corresponded to “hyposmia” (9.5 ± 2.7), while on the second visit, the average value was 13.1 ± 1.9, which corresponded to “normosmia.” According to the telephone survey, recovery of the olfactory function occurred within 10 days in 37 of 52 patients (71.2%), 11 to 29 days in 12 children (23.1%), and later than 30 days in 3 cases (5.7%).

Conclusion: In the pediatric population, olfactory dysfunction is an early and common symptom of COVID-19. Psychophysical testing was found to be more sensitive compared with the subjective survey (84.0% vs 66.7%, P = .010). Olfactory function in children with COVID-19 tends to recover quickly. On day 5, statistically significant positive dynamics were observed, and the overwhelming majority of patients (94.3%) had no subjective olfactory complaints within the first month; after 2 months, normal smell function was found in all patients according to the survey.

Standardizing Opioid Use After Pediatric Tonsillectomy Without Increasing Postoperative Returns

Holly Cordray (Presenter); Kathleen Smith, RN, CPN; Kara K. Prickett, MD

Introduction: Opioid prescription after pediatric tonsillectomy is common and highly variable, and it may not offer improved pain control over over-the-counter medications. Our objective was to evaluate the efficacy of a standardized post-tonsillectomy analgesic protocol that prioritizes opioid-sparing regimens for young children.

Method: A quality improvement project was conducted to standardize postoperative analgesic prescribing after hospital-based tonsillectomy ± adenoidectomy beginning in July 2019. Children 7 to 21 years received weight-based dosing of acetaminophen, ibuprofen, and acetaminophen-hydrocodone. Returns to the system were monitored prospectively. In 2021 a review was conducted of the 18 months before and after analgesic standardization. Opioid prescriptions, volume of narcotic prescribed, and postoperative returns to the system within 30 days were monitored.

Results: Across 2018 to 2020, 4083 cases were performed in the hospital setting. The frequency of opioid prescriptions for tonsillectomy ± adenoidectomy decreased significantly after analgesic standardization, from 38.7% to 24.1% (P < .001). For cases in which opioids were prescribed, the average
prescribed volume of the narcotic per kilogram of patient weight also decreased significantly poststandardization, from 7.9 mL/kg to 5.3 mL/kg ($P < .001$). Despite decreased opioid prescription number and volume, no change occurred in the frequency of returns to the system ($P = .42$).

**Conclusion:** Standardized analgesic protocols effectively reduced the utilization and volume of postoperative opioid prescriptions without a concomitant increase in returns to the system. Use of an opioid-sparing regimen for patients <7 years did not appear to compromise pain management.

### Swallowing Assessment of Children Using a Tracheostomy Speaking Valve

Stephen R. Chorney, MD, MPH (Presenter); Ashley B. Brown, CCC-Scalp; Hussein Jaffal, MD; Romaine F Johnson, MD, MPH

**Introduction:** Speaking valves have an uncertain benefit on swallowing physiology for children with a tracheostomy.

**Method:** A retrospective cohort study included tracheostomy-dependent children at a tertiary hospital between 2015 and 2020. All tracheostomies were placed under 12 months of age. The primary objective was acceptance of thin consistencies on videofluoroscopic swallowing studies (VFSS) or functional endoscopic evaluation of swallowing (FEES) between children tolerating and not tolerating a speaking valve. Secondary objectives compared Functional Oral Intake Scale (FOIS) rating and Secretion Severity Scores (SSS) among groups.

**Results:** A total of 55 children with a median age at tracheostomy of 4.5 months (interquartile range [IQR]: 2.3–6.2) were included. A total of 45 children underwent 52 VFSS, and 19 children underwent 19 FEES examinations. During VFSS, 67% were wearing a speaking valve for a median of 5.2 months (IQR: 3.4–11.0). There was no difference in age at tracheostomy ($P = .27$) or at VFSS ($P = .42$) between those wearing and not wearing a speaking valve. Rates of thin consistency penetration (21% vs 33%, $P = .31$), aspiration (7% vs 10%, $P = .73$), or pharyngeal residue (25% vs 40%, $P = .27$) were not different between groups. An FOIS of 3 or higher was identified for 40% of children with a speaking valve compared with 9% without ($P = .01$). During FEES, 47% were wearing a speaking valve for a median of 1.4 months (IQR: 0.3–6.1). There was no difference in age at tracheostomy ($P = .78$) or at FEES ($P = .94$) between groups. Rates of premature spillage (75% vs 63%, $P = .99$), pooling (56% vs 78%, $P = .60$), delayed swallow (57% vs 44%, $P = .99$), penetration (43% vs 33%, $P = .99$), or aspiration (38% vs 11%, $P = .29$) were similar. However, pharyngeal residue (57% vs 0%, $P = .03$) was higher among children wearing a speaking valve during FEES. High SSS rates were not different between groups (33% vs 20%, $P = .51$).

**Conclusion:** Children tolerating tracheostomy speaking valves had higher FOIS scores but increased thin pharyngeal residue on FEES. Penetration, aspiration, and SSS were not influenced by speaking valve use, suggesting uncertain physiological benefit of this device.

### Understanding Public Perceptions Regarding Cochlear Implant Surgery in Children

Lisa Zhang (Presenter); Andy S. Ding; Deborah X. Xie, MD; Francis X. Creighton, MD

**Introduction:** Recent studies demonstrate approximately 40% of eligible pediatric patients undergo cochlear implantation. The goal of this study was to understand public perceptions about pediatric cochlear implantation to identify barriers resulting in this low utilization.

**Method:** Participants completed a web-based survey ranking pediatric quality-of-life subdomains as well as their willingness to accept a 5% minor complication rate (changes in taste, vertigo) and a 1% major complication rate (infections requiring hospitalization, meningitis, reimplantation, facial paralysis, and cerebrospinal fluid leak) if their child required cochlear implant surgery.

**Results:** A total of 246 respondents (male 54%, mean age 36 years [range 19–68]) were included. Insurance coverage (27%) and fear of having their child undergo surgery (24%) were selected as top reasons for low utilization. Communication ability was most commonly selected as the most important quality-of-life subdomain (37%). Respondents indicated they were more willing to tolerate higher rates of all minor complications to achieve their highest quality-of-life priority but not for any major complications (both $P < .05$). In terms of predicting actual complication rates, respondents significantly overestimated all major surgical complications (all $P < .0001$) except for rates of postoperative vertigo, which was significantly underestimated ($P = .0023$).

**Conclusion:** Respondents indicated fear of surgery as a significant reason for low utilization of pediatric cochlear implantation but also significantly overestimated the occurrence of major postoperative complications. We hope our study will help frame discussions about pediatric cochlear implantation with regard to identifying quality-of-life priorities and managing expectations in risk tolerance with patients and their families.

### Urgent Adenotonsillectomy in Patients Hospitalized After Outpatient Polysomnography

Marike Mousset (Presenter); Abdulrahman Althubaiti, MBBS, FRCSC; Natalie Kelly; Amanda Onwuka, PhD, MPH; Tendy Chiang, MD; James M. Ruda, MD

**Introduction:** The role of urgent adenotonsillectomy (T&A) following polysomnography (PSG) in pediatric obstructive sleep apnea (OSA) is not well described in the literature. This study investigates the clinical characteristics, preoperative PSG abnormalities, and postoperative respiratory interventions in children urgently admitted after polysomnography.


**Method:** A retrospective cohort study was performed at our tertiary care pediatric hospital examining all children urgently admitted following outpatient PSG from 2010 to 2018. Patients, 1 to 18 years of age, who were urgently admitted following PSG were compared with a control group of patients with severe OSA who had planned elective adenotonsillectomy performed during the same study interval. Demographics, comorbidities, preoperative PSG findings, and postoperative respiratory support requirements were compared between groups.

**Results:** A total of 30 children were immediately hospitalized following polysomnography. The control group was composed of 347 children. Compared with controls, case patients were predominantly male, younger (median age 2.9 years vs 5.8 years; \( P = .001 \)), and more often had neuromuscular disorders (\( P = .0004 \)), congenital airway obstruction (\( P < .0001 \)), asthma/reactive airway disease (\( P < .0001 \)), and prematurity (\( P < .0001 \)). Similarly, case patients had PSG results with significantly higher median non-rapid eye movement (REM)/REM apnea-hypopnea indices (AHI); non-REM AHI 38.5 vs 18), peak \( \text{CO}_2 \) (59.5 vs 50 torr), lower \( \text{O}_2 \) nadirs (50% vs 77%), higher need for \( \text{O}_2 \) supplementation (\( P < .0001 \)), and positive-pressure support requirements postoperatively (\( P < .0001 \)) including home-going oxygen (\( P < .0001 \)) or positive-pressure support (\( P = .02 \)) than controls did.

**Conclusion:** In our series, patients receiving T&A following urgent hospitalization post-PSG were younger, had more comorbidities, higher postoperative respiratory requirements, and higher degree of severe OSA than similar patients not admitted after outpatient PSG. In this population, more intense postoperative support may be required given these underlying features.

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**Using the Craniovertebral Angle to Quantify Intraoperative Ergonomic Risk**

Natalie Kelly (Presenter); Marike Mousset; Abdulrahman Althubaiti, MBBS, FRCS; Amanda Onwuka, PhD, MPH; Tran Bourgeois, MPH; Tendy Chiang, MD

**Introduction:** Surgical intervention of the oral cavity and oropharynx compels the otolaryngologist to adopt an abnormal neck posture including a forward head position (FHP). This position shifts the center of gravity, using the upper body to drift backward, creating ergonomic risk that can result in pain and limitation in range of motion. We have identified that tonsillectomy places the surgeon at higher ergonomic risk, particularly in the neck and trunk regions. These regions can be objectively quantified by calculating craniovertebral angle (CA). The CA measures FHP, and individuals who consistently maintain CA values outside of mean CA are at risk for neck pain and injury. The aim of our study was to quantify CA during tonsillectomy and validate the interrater reliability of our approach.

**Method:** A prospective study was conducted by evaluating neck posture during 11 tonsillectomies. Lateral images of the surgeon were captured every minute throughout the procedure in a standardized method. Images were assessed by 3 raters, measuring the CA, defined as the angle between a horizontal line through C7 vertebrae and another line that passes through C7 and the tragus of the ear. Interrater reliability of CA was evaluated for 3 raters using the kappa statistic. Per prior publications, reports of neck pain are frequent when the CA value was <50°; thus, we defined an abnormal posture if the CA was <50°.

**Results:** Average CA during tonsillectomy was 24.9°. The range of values was from 10° to 55°, and 100% of procedures had at least 1 assessment of abnormal posture. The lowest interrater reliability was 0.77 (CI: 0.67, 0.87) and the highest was 0.82 (CI: 0.74, 0.90).

**Conclusion:** Poor posture during tonsillectomy places otolaryngologists at ergonomic risk. The CA is an important indicator of future neck pain and injury, and a pathologic neck position during tonsillectomy was identified in this study. Given the high interrater reliability of CA, our approach to assessing surgical ergonomics can be used to objectively quantify the effect of intraoperative interventions designed to mitigate ergonomic risk.

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**Changes in Otolaryngology Career Preferences During Training**

Ryan M. Carey, MD (Presenter); Alyssa M. Civantos; Daniel O. Kraft; Kearney J. James, MD; Michael J. Ruckenstein, MD; Tiffany N. Chao, MD

**Introduction:** Perspectives on different otolaryngology career options and practice settings may develop over the course of residency.

**Method:** A cross-sectional survey was distributed to program coordinators at 109 accredited otolaryngology programs for dissemination to residents. Residents were asked to respond to questions on sociodemographic factors, preferred future practice settings (academic hospital, nonacademic hospital, mixed hospital and private practice, solo private, group private), and their impressions of different aspects of clinical practice (autonomy, mastery, and work–life balance). Descriptive statistics and correlations were evaluated and responses were compared between junior (postgraduate year [PGY]1–3) and senior residents (PGY4–5).

**Results:** A total of 110 residents (53% male) provided responses to the survey, including 71 (64.5%) junior residents and 39 (35.5%) senior residents. Most senior residents were married (62%) compared with about half of junior residents (47%). More senior residents had children compared with junior residents (33% vs 11%, \( P = .005 \)). The most common bracket of student debt for junior and senior residents was $100,000 to $250,000 at 37% and 36%, respectively. There was a significant difference in the distribution of practice environments that junior and senior residents expected to work in after training (\( P = .01 \)). The most common anticipated practice settings reported by junior residents were academic (35%), mixed hospital and private practice (27%), and unknown (23%).