



**ARS at COSM 2021**  
*Virtual Conference*  
**PROGRAM GUIDE**

April 11, 2021



Joseph K Han, MD, FARS

## Presidential Welcome to the ARS at COSM 2021



It is my pleasure to welcome you to the 2021 American Rhinologic Society virtual meeting at COSM. The ARS meeting at COSM represents one of the best educational rhinology programs that the American Rhinologic Society offers to its membership. This year's Program Chair and President Elect, Rodney Schlosser, MD, has assembled an exciting and dynamic program that will feature leaders in our field discussing current topics and the latest developments in clinical and basic science research. Scientific abstracts will include the most up to date information in rhinology, allergy, immunology, and skull base surgery topics. I would like to thank the Dr. Schlosser and the Program Committee for their hard work in developing a wonderful program which will be held on just one day, April 11th, 2021. I would like to thank all the moderators, panelists, and presenters for their contributions for this and past virtual ARS meetings, which have been hugely successful despite the difficulties surrounding this past and current year. I would also like to acknowledge and thank all our corporate partners. Without their support this and all our scientific meetings would not be possible.

I would like to also personally thank you for being a fellow or member of the ARS and for continuing to contribute to the success of our society. The benefits of ARS membership continue to expand, and include access to a variety of educational content of the ARS such as RhinoCast and instructional webcasts as well as subscription to the International Forum of Allergy and Rhinology (IFAR), the journal of the ARS. Being an ARS member or fellow provides discounted rates for our exciting scientific meetings such as the ARS Summer Sinus Symposium. This year the ARS SSS will be held in Austin on July 23-25, 2021. The Summer Sinus Symposium provides great clinical and practical content that is helpful for all practitioners of Rhinology at every level. After being insulated for a year, the ARS SSS will provide a great opportunity for brilliant education and time to reunite with your colleagues.

Finally, I am honored and humbled to serve as president of this amazing society, and would like to thank the leadership, committee chairs and members, and staff for their hard work that makes the ARS such a vibrant and progressive society, and the worldwide leaders in Rhinologic care and education.

Joseph K Han, MD, FARS  
*President, American Rhinologic Society*

## Welcome from the Program Chair



Rodney Schlosser, MD,  
FARS

While the COVID pandemic drastically limited travels this past year, it has actually resulted in a number of great opportunities. Our 2021 ARS COSM Program will take advantage of a virtual format by having panels with international and multi-disciplinary expertise, so there will be something for everyone!

I would like to highlight several recent initiatives within the ARS that should be of interest to otolaryngologists around the world. Our meeting will be kicked off the morning of April 11, 2021 by our keynote speaker, Deb Tucci, MD, and is co-sponsored by our Women in Rhinology Section. Dr. Tucci is Director of the National Institute on Deafness and Other Communication Disorders at the National Institutes of Health, a position she has held since September 2019. Deb's talk will be "A Proposal to Develop and Sustain the Otolaryngology Surgeon Scientist Workforce: An NIDCD-Academic Partnership."

The morning session will include our top original research presentations and two panels that will be particularly relevant to all of our members. The ARS recently created the Diversity Committee, chaired by Troy Woodard, MD, and the panel, Inclusive care for diverse rhinology patients, is guaranteed to change the way you view patient care. COVID has also changed patient care and Zara Patel, MD and her panelists will provide a stimulating discussion on the International COVID Update.

We will have two concurrent afternoon sessions with additional original research presentations, as well as additional panels to impact your practice. Recent sections started by the ARS include the Allergy and Immunology in Rhinology (AIR) and Skull Base sections. AIR Chair, Amber Luong, MD will moderate a panel on Biologics in AERD with multi-disciplinary experts, while Richard Harvey, MD, PhD, and his international panelists will discuss enhancements in the care of endoscopic skull base patients. Finally, as evidenced by the virtual platform for many of our CME events, technology and the pandemic have dramatically changed rhinology education from understanding surgical techniques to fellowship and residency education. Stacey Gray, MD, and her panelists will discuss this rapid evolution and where we are headed.

As you can see, this program touches upon several recent initiatives within the ARS and will provide relevant updates on clinical care, research, and education. We look forward to seeing everyone virtually this spring and hopefully in person in Los Angeles for our Annual Meeting.

*Rodney Schlosser, MD, FARS  
Program Chair*

### ARS COSM 2021 Program Committee

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*Program Chair*

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## ARS Mission Statement

The American Rhinologic Society's mission is to serve, represent and advance the science and ethical practice of rhinology. The Society promotes excellence in patient care, research and education in Rhinology and Skull Base Disorders. The American Rhinologic Society is dedicated to providing communication and fellowship to the members of the Rhinologic community through on-going medical education, patient advocacy, and social programs. The ARS continuing medical education activities serve to improve professional competence, performance, and promote research.

## Business/ACCME

### Continuing Education

#### Accreditation Statement

The American Rhinologic Society (ARS) is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

#### Credit Designation Statement

ARS designates this live activity for a maximum of 12.70 AMA PRA Category 1 Credit(s)<sup>™</sup>. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

COSM 2021 Virtual will offer up to 118.75 AMA PRA Category 1 Credit(s)<sup>™</sup> and up to 118.75 CME for MOC points. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

## Learning Objectives from Practice Gaps

At the conclusion of this meeting participants will be able to:

- Understand the impact of patient diversity in a rhinology practice
- Understand international management of COVID-19 for rhinologists
- Understand and learn how to choose a biologic for AERD patients
- Understand latest advancements in endoscopic skull base surgery

## How to obtain your CME certificate:

1. Complete an evaluation within the virtual event platform by June 30, 2021.
2. The claim link will be available within the platform (click on CME) following the meeting. CME and MOC are available for both live and on-demand sessions and posters.
3. Once you complete the evaluation, a certificate will be made available for you to print.

### Questions?

Email [cosmsupport@facs.org](mailto:cosmsupport@facs.org)



Presents at  
COSM 2021



# Being Human: Exploring Conscious & Unconscious Bias in Health Care

Sunday April 11, 2021 from 7-8 AM CST

*With Special Guest Speakers*



Tracy Smart, AO

Prof, Australian Natl Univ

Australia



Angela Ballantyne, Ph.D

Assoc Prof, Univ of Otago

New Zealand

Registration: [https://zoom.us/webinar/register/WN\\_yd\\_ec6qiRGChAa80Z6Ri7g](https://zoom.us/webinar/register/WN_yd_ec6qiRGChAa80Z6Ri7g)

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**PRESENTATIONS - PROGRAM AT-A-GLANCE****(R)** Recorded **(L)** Live**Morning Session****7:00 AM - 12:00 PM CST**

7:00 AM-8:00 AM

**Women in Rhinology Session (L)****“Being Human: Exploring Conscious & Unconscious Bias in Healthcare”**

Guest Speakers:

Tracy Smart, MD, Air Vice-Marshal, Australia

Angela Ballantyne, PhD, Associate Professor, University of Otago, New Zealand

**Registration:**[https://zoom.us/webinar/register/WN\\_yd\\_ec6qiRGChAa80Z6Ri7g](https://zoom.us/webinar/register/WN_yd_ec6qiRGChAa80Z6Ri7g)

8:00 AM-8:05 AM

**Welcome (R)**

Joseph Han, MD, FARS and Rodney Schlosser, MD, FARS

8:05 AM – 8:40 AM

**Keynote Address: Proposal to Develop and Sustain the Otolaryngology Surgeon Scientist Workforce: AN NIDCD – Academic Partnership (L)**

Guest Speaker: Debara L. Tucci, MD, MS, MBA

Director, National Institute of Deafness and Other Communication Disorders, National Institute of Health

**Cutting Edge Research and Hot Topics****Moderators: Joshua Levy, MD, FARS; Jose Mattos, MD; Kara Detwiller, MD**

8:40 AM-8:47 AM

**Dupilumab therapy increases sinonasal mucosal expression of IL-13 in CRSwNP (R)**

Presented by Kathleen M. Kelly, MD

8:47 AM-8:54 AM

**Inflammatory heterogeneity in aspirin exacerbated respiratory disease (R)**

William Scott, MD

8:54 AM- 9:01 AM

**Targeted replacement of full-length CFTR in human airway stem cells by CRISPR/Cas9 gene editing of the endogenous locus (R)**

Dawn Bravo, PhD

9:01 AM-9:06 AM **Q&A (L)**

9:06 AM-9:13 AM

**Fractional exhaled nitric oxide as a biomarker of mucosal inflammation in chronic rhinosinusitis (R)**

Stella Lee, MD

9:13 AM-9:20 AM

**Chronic particulate matter air pollution exposure is associated with anosmia: A Case: Control Study (R)**

Murugappan Ramanathan, Jr., MD, FARS

Presented by Nicholas Rowan, MD

9:20 AM-9:27 AM

**A new instrument for measurement of clinical outcome after lacrimal surgery: Tearing assessment and rating scale-12 (TEARS-12) (R)**

Jonathan Simmonds, MD

9:27 AM-9:32 AM **Q&A**9:32 AM-9:47 AM **Break**

9:47 AM-10:27AM

**Panel:****Inclusive care for diverse rhinology patients (L)**

Moderator: Rodney J. Schlosser, MD, FARS

Panelists: Jean Anderson Eloy, MD, FARS; Devyani Lal, MD, FARS; David Gudis, MD, FARS; Troy Woodard, MD, FARS

**Moderators: Stella Lee, MD; Daniel Beswick, MD, FARS; Do Yeon Cho, MD**

10:27 AM-10:34 AM

**The relationship of bitter taste receptors and COVID-19 (R)**

Mohamed Darwish, MD

10:34 AM-10:41 AM

**SARS-CoV-2 infection of human nasal mucosa in vitro is increased in CRSsNP (R)**

Andrew Lane, MD, FARS

10:41 AM-10:48 AM

**Risks factors and characteristics associated with persistent smell loss with COVID-19 (R)**

Bitu Shahrvi

10:48 AM-10:53 AM **Q&A (L)**

10:53 AM-11:00 AM

**Ambient noise levels and wireless headsets for communication in aerosolizing otolaryngology surgery during COVID-19 (R)**

Marc Levin, MD

11:00 AM-11:07 AM

**Assessment of Patient Recognition of COVID-19-associated Olfactory Loss and Recovery – A Longitudinal Study (R)**

Divya Prajapati, BS

11:07 AM-11:14 AM

**Differential smell and taste outcomes in COVID 19: Single-center large population study (R)**

Nikita Chapurin, MD

11:14 AM-11:20 AM **Q&A (L)**

11:20 AM-12:00 PM

**Panel****COVID-19 and rhinology: An international update (L)**

Moderator: Zara Patel, MD, FARS

Panelists: Carol Yan, MD; Claire Hopkins, MD; Leigh Sowerby, MD; Puya Dehghani-Mobaraki, MD; Benjamin Bleier, MD, FARS

12:00 PM-1:00 PM

**Lunch/Visit with Exhibitors**

## Afternoon Session

### 1:00 PM - 5:00 PM CST; Room A

**Rhinology Education and Skull Base Updates**

1:00 PM-1:40 PM

**Panel: Current and future changes to rhinology education (L)**

Moderator: Stacey Gray, MD, FARS

Panelists: Eugene Chang, MD, FARS; Elina Toskala, MD, FARS; Mark Tewfik, MD; David Poetker, MD, FARS

**Moderators: Waleed Abuzeid, MD; Adam DeConde, MD; Dana Crosby, MD, FARS**

1:41 PM-1:48 PM

**Implementation of time-driven activity-based costing to analyze cost drivers in functional endoscopic sinus surgery (R)**

Shravani Pathak, BA

1:48 PM-1:55 PM

**Are NSAIDs effective enough for postoperative pain control after functional endoscopic sinus surgery and septoplasty: A randomized controlled study (R)**

Alok Saini, MD

1:55 PM-2:02 PM

**Effect of nasal suction catheters on aerosol generation during endoscopic sinus surgery (R)**

Alexander Murr, BS

2:02 PM-2:09 PM

**Postoperative care trends between fellowship and non-fellowship trained physicians following ESS: 2017 (R)**

Monica Kirollos, BS

2:09 PM-2:14 PM **Q&A (L)****Moderators: Andrew Lane, MD, FARS; Charles Riley, MD; Kristine Smith, MD**

2:15 PM-2:22 PM

**Endoscopic sinus surgery for chronic rhinosinusitis: 5-year clinical outcomes (R)**

Jonathan Simmonds, MD

2:22 PM-2:29 PM

**The relationship between socioeconomic status, exposure to airway pollutants and impact on chronic rhinosinusitis disease severity (R)**

Stella Lee, MD

2:29 PM-2:36 PM

**The association between modified frailty index and postoperative outcomes in endoscopic sinus surgery (R)**

Khodayar Goshtasbi, MS

2:36 PM-2:43 PM

**Long-acting implantable corticosteroid matrix for chronic rhinosinusitis: Results of LANTERN Phase 2 randomized controlled study (R)**

Yina Kuang, PhD

*Presented by Anders Cervin, MD, PhD*2:43 PM-2:48 PM **Q&A (L)**2:48 PM-3:05 PM **Break****Moderators: Jean Kim, MD, FARS; Garret Choby, MD, FARS; Victoria Lee, MD**

3:05 PM-3:12 PM

**Racial, ethnic, and gender disparities in registered clinical trials for chronic rhinosinusitis with nasal polyposis (R)**

Daniel Spielman, MD

3:12 PM-3:19 PM

**Diagnosis and management of barosinusitis: A systematic review (R)**

Tiffany Chen, BA

3:19 PM-3:26 PM

**Marsupialization with a mucosal graft reduces recurrence after endonasal surgery of Rathke's cleft cyst (R)**

Mandy Salmon, BS

3:26 PM-3:33 PM

**The effect of obstructive sleep apnea on surgical outcomes of orbital decompression for thyroid eye disease (R)**

Tory McKnight, BS

3:33 PM-3:38 PM **Q&A (L)****Moderators: Marilene Wang, MD, FARS; Mathew Geltzeiler, MD, FARS; Gretchen Oakley, MD, FARS**

3:39 PM-3:46 PM

**Race, disease-specific survival, and conditional survival in primary sinus malignancies (R)**

Rahul Sharma, BS

3:46 PM-3:53 PM

**Factors associated with delivery of postoperative radiotherapy at a different facility in sinonasal cancer (R)**

Jeff Gao

3:53 PM-4:00 PM

**Trends in HPV testing for patients with sinonasal squamous cell carcinoma: A national analysis (R)**

Christopher Tseng, BS

4:00 PM-4:07 PM

**Can indocyanine green fluorescence angiography predict skull base reconstructive flap necrosis? (R)**

Uma Ramaswamy, MD

4:07 PM-4:12 PM **Q&A (L)**

4:15 PM-5:00 PM

**Panel**

**Beyond “I can do it endoscopically”: Enhancing patient care in the current era of skull base surgery (L)**

Moderator: Richard Harvey, MD, FARS

Panelists: Brian Thorp, MD, FARS; Corinna Levine, MD, FARS; Nicholas Rowan, MD; Gretchen Oakley, MD, FARS

## Afternoon Session

### 1:00 PM - 5:00 PM CST; Room B

Advances in Inflammatory Disease

**Moderators: Cecelia Damask, DO; Jonathan Ting, MD, FARS; Eric Wang, MD, FARS**

1:00 PM-1:07 PM

**Resonant vibration of the sinonasal cavities for the treatment of nasal congestion (R)**

Ashoke Khanwalkar, MD

1:07 PM-1:14 PM

**Baseline subjective and objective measures in patients with allergic rhinitis: A systematic review (R)**

Andraia Li, BS

1:14 PM-1:21 PM

**Hypothalamic-Pituitary-Adrenal (HPA) axis suppression and long-term intra-nasal corticosteroid use: A systematic review and meta-analysis (R)**

Amirpouyan Namavarian

1:21 PM-1:28 PM

**Radiological assessment of high anterior septal deviation and its impact on sinus access (R)**

Joshua Lee, MD

1:28 AM-1:33 PM **Q&A (L)**

**Moderators: Christine Franzese, MD, FARS; Naweed Chowdhury, MD; Arthur Wu, MD, FARS**

1:34 PM-1:41 PM

**Inhibiting the TH2 pathway with dupilumab causes a shift to type 1 inflammatory cytokine production (R)**

Stella Lee, MD

1:41 PM-1:48 PM

**Treatment outcomes of AERD (Aspirin Exacerbated Respiratory Disease) patients treated with aspirin desensitization (AD), biologics (B) or both biologics and desensitization (BD) therapy (R)**

Glen D'Souza, MD

1:48 PM-1:55 PM

**Asthma increases long-term revision rates of endoscopic sinus surgery in chronic rhinosinusitis with and without nasal polyposis (R)**

Amarbir Gill, MD

1:55 PM-2:02 PM

**Central compartment atopic disease: Comparative analysis of surgical outcomes amongst subtypes of chronic rhinosinusitis with nasal polyps (R)**

Andrew Steehler, BS

2:02 PM-2:07 PM **Q&A (L)**

2:07 PM-2:25 PM **Break**

2:25 PM-3:10 PM

**Panel: Where do biologics fit in the management algorithm of Aspirin Exacerbated Respiratory Disease? (L)**

Moderator: Amber Luong, MD, PhD, FARS

Panelists: John Bosso, MD; Tanya Laidlaw, MD; Justin Turner, MD, FARS; Lauren Roland, MD

**Moderators: Michael Kohanski, MD; Nyall London, MD; Angela Donaldson, MD, FARS**

3:10 PM-3:17 PM

**Adverse events of oral antibiotic therapy for acute rhinosinusitis in the pediatric population: A systematic review and meta-analysis (R)**

Lucas Axiotakis

3:17 PM-3:24 PM

**A novel oxygen-generating biomaterial for CRS therapy (R)**

Do Yeon Cho, MD

3:24 PM-3:31 PM

**Endoscopic sinus surgery for Cystic Fibrosis: Variables influencing sinonasal and pulmonary outcomes (R)**

Keven Ji, MD

3:31 PM-3:38 PM

**Topical nasal administration of ciprofloxacin in chronic rhinosinusitis: a prospective study (R)**

David Dias, MD

3:38 PM-3:43 PM **Q&A (L)**

**Moderators: John Craig, MD, FARS; David Jang, MD, FARS; Alissa Kanaan, MD**

3:44 PM-3:51 PM

**Systematic review and voxel-based meta-analysis of gray matter alterations in olfactory dysfunction (R)**

Andraia Li, BS

3:51 PM-3:58 PM

**Association between social determinants of health and olfactory function: A scoping review (R)**

Joel James, BS

3:58 PM-4:05 PM

**Intraoperative application of CNN-automated segmentation of anterior skull base structures with a novel 3D navigation system (R)**

Caio Neves, MD

4:05 PM-4:12 PM

**Treatment of epistaxis using the National Inpatient Sample and Centers for Medicare/Medicaid Services national databases: A comparison of endovascular and endoscopic procedures (R)**

Tory McKnight, BS

4:12 PM-4:17 PM **Q&A (L)**

**Moderators: Erin O'Brien, MD, FARS; Frederick Yoo, MD; Philip Chen, MD, FARS**

4:18 PM-4:25 PM

**Clinical features of parosmia associated with SARS-CoV-2 infection (R)**

Katherine Garvey, MPH

4:25 PM-4:32 PM

**COVID-19 related olfactory dysfunction incidence and natural history among ambulatory patients (R)**

Daniel Bacon, BS

4:32 PM-4:39 PM

**Telehealth and the otolaryngology patient: A comparison of patient satisfaction with in-office appointments and virtual visits due to COVID-19 (R)**

Annie Arrighi-Allisan, BA

4:39 PM-4:46 PM

**COVID smell tracker: A novel research-based mobile application to study anosmia and ageusia in subjects with COVID-19 (R)**

Tory McKnight, BS

4:46 PM-4:53 PM

**Middle East burn pit exposure is associated with decreased sinonasal quality of life in returning deployers (R)**

Christopher Hill, MD

4:53 PM-5:00 PM **Q&A (L)**

**COSM 2021 | POSTERS**

Poster #001

**3D printing as a planning tool to optimize post-surgical sinonasal sinus irrigation**

Kanghyun Kim, BS

Poster #002

**A Multidisciplinary Approach to Sino-Orbital Osteoma**

James Connelly, BA

Poster #003

**Adverse events associated with corticosteroid-eluting sinus stents**

Vishal Narwani, MD

Poster #004

**Analyzing the practice patterns of otolaryngologists in the United States during the COVID-19 pandemic**

Laura Van De Laar, MD

Poster #005

**Atypical cause of facial nerve palsy and otorrhea: Sinonasal squamous cell carcinoma with direct spread to both ears**

Jason Lim, MBBS (Hons)

Poster #006

**Can the 5-item modified frailty index predict outcomes following resection of intradural skull base lesions**

Khodayar Goshtasbi, MS

Poster #007

**Case report: Sinonasal tumor - a diagnostic conundrum**

Haran Devakumar, MBBS

Poster #008

**Combined exhalational delivery system with fluticasone and budesonide nasal irrigations in patients with chronic rhinosinusitis with nasal polyposis: A preliminary report**

Rosalie Machado

Poster #009

**Conditional and overall disease-specific survival in patients with sinus cancer: Improved outcomes in the endoscopic era**

Rahul Sharma, BS

Poster #010

**Correlation between the ENT domain of Birmingham Vasculitis Activity Score (BVAS) and the Rhinosinusitis Disability Index (RSDI)**

Daniel Bacon, BS

Poster #011

**Cytotoxic effects of permethrin on cultured human sinonasal epithelial cells**

Tara Wu, MD

Poster #012

**Development of a multi-media educational module of sinonasal anatomy: Face and content validity**

Christopher Bailey, MD, PhD

Poster #013

**Diagnosis and localization of cerebrospinal fluid rhinorrhea: A systematic review**

Kelvin Zhou, Medical Student

Poster #014

**Diffuse nasal papillomatosis of multiple histologic subtypes**

Thomas Fitzpatrick, MD

Poster #015

**Does eustachian tube dilation help patients with type A tympanograms and elevated ETDQ-7 scores?**

Danielle Warner, MD

Poster #016

**Embolization following SPA ligation: Outcomes and risk factors for recurrent bleeding**

Teddy Klug, MD

Poster #017

**Evaluating correlation between different nasal septum deviation classifications systems and patients complaints**

David Dias, MD

Poster #018

**Ganglioneurofibroma of the pterygopalatine fossa: case report and review of the literature**

Kathryn L. Kreicher, MD

Poster #019

**Giant cell lesions of the sinuses and skull base: Case series and review of literature**

Samyuktha Melachuri, BS

Poster #020

**Impact of CFTR therapy on CRS: Deep learning sinus CT analysis, quality of life and productivity loss**

Daniel Beswick, MD, FARS

Poster #021

**Impact of COVID-19 on resident otolaryngology training**

Akshay Murthy, BS

Poster #022

**Impact of obesity on surgical outcomes in patients with chronic rhinosinusitis undergoing endoscopic sinus surgery**

Viraj Patel, MD

Poster #023

**Longitudinal analysis of Twitter trends for sinusitis**

Lydia Weykamp, BS

Poster #024

**Magnetic resonance imaging findings in patients with olfactory dysfunction: A systematic review**

Nanki Hura, BS

Poster #025

**Management of skull base chondromyxoid fibroma: Rare presentation and literature review**

Elizabeth Stephenson, MD

Poster #026

**Mepolizumab reduces the need for surgery in patients with chronic rhinosinusitis with nasal polyps**

Wyske Fokkens, MD, PhD

Poster #027

**Minimally invasive endoscopic distraction osteogenesis maxillary expansion (DOME- MinE): Restoring nasal breathing in adult OSA patients with high arched palates**

Mohamed Abdelwahab, MD

Poster #028

**Mucocele of the maxilla as a late complication of maxillary advancement surgery**

Bishoy N. Ibrahim, BS

Poster #029

**Nasoseptal chondromucosal flap for oroantral fistulas**

Andi Liebowitz, BA

Poster #030

**Olfactory dysfunction predicts the development of vascular disease in older adults**

Teresa Xiao, Medical Student

Poster #031

**Olfactory outcomes after technical variations in transsphenoidal endoscopic skull base surgery**

Jack Birkenbeuel, Medical Student

Poster #032

**Otolaryngologist assessment of nasal septum deviation**

Roberto Frusciante, MS4 Medical Student

Poster #033

**Postoperative pain management after hereditary hemorrhagic telangiectasis lesion coblation: a prospective study**

Kristen Kraimer, MD

Poster #034

**Predictors of post-operative nausea and vomiting after endoscopic skull base surgery**

Jack Birkenbeuel, Medical Student

Poster #035

**Profuse intraoperative hemorrhage in a hereditary hemorrhagic telangiectasia patient: A case report**

Chetan Safi, Resident Physician

Poster #036

**Reduction in visits to emergency department for acute rhinologic and allergic complaints during COVID-19 pandemic**

Evan Kominsky, BA

Poster #037

**Safety of nasopharyngeal swabs: are patients getting the accurate recommendations?**

Taylor Fish, BS

Poster #038

**Severe bilateral orbital subperiosteal abscesses in a patient with Woakes Syndrome**

Anthony Leonard, MD, PhD

Poster #039

**Simultaneous use of endoscopic and endovascular technique to control refractory epistaxis**

Janine Rotsides, MD

Poster #040

**Sinus culture differences between patients with radiographic signs of odontogenic sinus disease**

Tyler Merrill, MD

Poster #041

**Sinusitis in the Bronx: Impact of demographics, patient characteristics, and socioeconomic status on disease epidemiology and outcomes**

Viraj Patel, MD

Poster #042

**Survey of anesthesiologists on topical vasoconstrictors and intravenous tranexamic acid for endoscopic sinus surgery**

Max Feng, BS

Poster #043

**The power of Twitter to identify novel symptoms in COVID-19**

William Swift, BS

Poster #044

**Transeyelid orbitotomy approach for isolated type IV frontal cell pathology: A case series and systematic review of the literature**

Tara Wu, MD

Poster #045

**Transorbital-transsinus resection of sinonasal malignances with extraconal orbital invasion**

Jeffrey Radabaugh, MD

Poster #046

**Unusual cause of acute sinusitis and orbital abscess in COVID-19 positive patient**

Teddy Klug, MD

Poster #047

**Workforce analysis of allergy immunotherapy Medicare providers**

Tam Ramsey, MD

# ORAL PRESENTATIONS

(R) Recorded (L) Live

## Sunday, April 11, 2021 Morning Session – 7:00am – 12:00 pm CST

7:00 AM-8:00 AM

### Women in Rhinology Session (L) “Being Human: Exploring Conscious & Unconscious Bias in Healthcare”

Guest Speakers: Tracy Smart, MD, Air Vice-Marshall, Australia; Angela Ballantyne, PhD, Associate Professor, University of Otago, New Zealand

#### Registration:

[https://zoom.us/webinar/register/WN\\_yd\\_ec6qiRGChAa80Z6Ri7g](https://zoom.us/webinar/register/WN_yd_ec6qiRGChAa80Z6Ri7g)

8:00 AM-8:05 AM

### Welcome (R) Joseph Han, MD, FARS and Rodney Schlosser, MD, FARS

8:05 AM – 8:40 AM

### Keynote Address: Proposal to Develop and Sustain the Otolaryngology Surgeon Scientist Workforce: AN NIDCD – Academic Partnership (R)

Guest Speaker: Debara L. Tucci, MD, MS, MBA  
Director, National Institute of Deafness and Other Communication Disorders, National Institute of Health

## Cutting Edge Research and Hot Topics

**Moderators: Joshua Levy, MD, FARS; Jose Mattos, MD; Kara Detwiller, MD**

8:40 AM - 8:47 AM

### Dupilumab therapy increases sinonasal mucosal expression of IL-13 in CRSwNP (R)

Andrew Lane, MD, FARS  
Presented by Kathleen Kelly, MD  
Heather Kulaga  
Johns Hopkins School of Medicine

#### Background:

Dupilumab, which inhibits the dual signaling pathways of IL-4 and IL-13, has proven an effective treatment option for many medically- and surgically-recalcitrant CRSwNP patients. While much has been learned regarding type 2 mediators and eosinophilic inflammation, the precise pathophysiological mechanisms underlying nasal polyposis remain incompletely understood, including how these pathways are impacted by Dupilumab.

#### Methods:

Polypoid mucosa samples were obtained from 10 recalcitrant CRSwNP patients, before and after initiating Dupilumab. Nasal endoscopy, SNOT-22, and UPSIT were also performed. Real-time PCR was used to assess the level of IL-13, IL-4, and TSLP mRNA in the samples. Immunohistochemistry was performed when sufficient tissue was available.

#### Results:

All 10 subjects demonstrated clinical improvement on Dupilumab. A significant increase in IL-13 mRNA expression was observed in the 7 study subjects who had been receiving therapy for greater than 6 months. IL-13 mRNA was not

significantly increased in subjects when treatment had been for 3 months or less. Increased IL-13 expression was correlated with elevated expression of TSLP, but not IL-4.

#### Conclusion:

In recalcitrant CRSwNP patients, long-term use of the biologic Dupilumab appears to result in increased IL-13 mRNA expression in the sinonasal mucosa. This suggests that upstream drivers of type 2 inflammation remain activated despite sustained subjective and objective improvement, even when downstream epithelial changes and eosinophilic infiltration improve. Subcellular analysis of dupilumab-treated tissues allows insight into upstream mechanisms in nasal polyp pathogenesis that may define further endotypes and suggest more targeted therapies.

8:47 AM – 8:54 AM

### Inflammatory heterogeneity in aspirin exacerbated respiratory disease (R)

William Scott, MD  
Katherine Cahill  
Rakesh Chandra, MD, FARS  
Naweed Chowdhury, MD  
Justin Turner, MD, FARS

#### Background:

Aspirin-exacerbated respiratory disease (AERD) is a distinct subtype of chronic rhinosinusitis with nasal polyps (CRSwNP). Though frequently associated with type 2 inflammation, literature characterizing the milieu of inflammatory cytokines and lipid mediators in AERD has been conflicting.

#### Objective:

The purpose of this study was to identify differences in the inflammatory signature between CRSwNP and AERD and determine whether endotypic subtypes of AERD may exist.

#### Methods:

Levels of 7 cytokines representative of type 1, type 2, and type 3 inflammation were measured in nasal mucus from 109 patients with CRSwNP and 30 patients with AERD. Twenty-one lipid mediators were measured in patients with AERD using (UPLC)-mass spectrometry. Demographic and clinical information were collected, and patients were prospectively administered the 22-item sinonasal outcomes test (SNOT-22). Differences in inflammatory mediators were identified between groups and patterns of inflammatory burden among AERD patients were determined by hierarchical cluster analysis.

#### Results:

AERD could be distinguished from CRSwNP by profoundly elevated levels of IL-5, IL-6, IL-13, and IFN-g, however, significant heterogeneity in inflammatory burden existed between patients. Hierarchical cluster analysis identified three inflammatory sub-endotypes of AERD. Several eicosanoids and lipid metabolites were associated with asthma and sinonasal disease severity.

#### Conclusion:

Collectively, AERD is associated with elevations in type 2 cytokines (IL-4, IL-5, and IL-13) and of the type 1 cytokine, IFN-g. However, the inflammatory signature in AERD is heterogeneous, potentially secondary to sub-endotypes of the disease.

8:54 AM - 9:01 AM

**Targeted replacement of full-length CFTR in human airway stem cells by CRISPR/Cas9 gene editing of the endogenous locus (R)**

Dawn Bravo, PhD  
Sriram Vaidyanathan  
Tushar Desai, MD  
Zachary Sellers, MD, PhD  
Jayakar Nayak, MD, PhD  
Stanford University School of Medicine

Cystic fibrosis (CF) is caused by mutations in the Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) Cl<sup>-</sup>/HCO<sub>3</sub><sup>-</sup> channel expressed in airway epithelium. Loss of CFTR-mediated anion and fluid transport hinders the innate defenses of the airway epithelium, leading to a cascade of mucus pooling, polymicrobial upper (sinus) and lower (pulmonary) airway infections, respiratory failure and reduced life expectancy in most CF patients. The development of a novel, personalized strategy to durably restore CFTR, and consequently epithelial cell/tissue, functions to the CF airway epithelium in these patients is desirable. While symptomatic treatments for CF are available, they must be administered daily with severe side effects and cannot be used to treat all patients. In an effort to restore CFTR function we sought to correct not only the most common CFTR mutation, DF508, but the entire CFTR gene using CRISPR/Cas9 gene editing. The strategy utilized dual adeno-associated viruses (AAV) that sequentially inserted two halves of the CFTR cDNA into airway basal stem cells (UABCs). A truncated CD19 (tCD19) enrichment tag was engineered to select for corrected the UABCs. The modified cells were enriched to obtain 60-80% tCD19+ UABCs from different CF donors having a wide variety of mutations. In epithelial sheets produced from corrected UABCs we measured restored CFTR mediated chloride transport that was on average >70% of the levels seen in non-CF controls. Our studies indicate that this strategy can restore CFTR function beyond the 15% threshold and enables the restoration of CFTR function to levels seen in asymptomatic CF carriers. These studies facilitate development of possible autologous airway stem cell therapy for all CF patients.

9:01 AM - 9:06 AM

**Q&A (L)**

9:06 AM - 9:13 AM

**Fractional exhaled nitric oxide as a biomarker of mucosal inflammation in chronic rhinosinusitis (R)**

Stella Lee, MD  
Tolani Olonisakin, Medical Student  
John Moore, Research Coordinator  
Jymirah Morris, Medical Student  
Sally Wenzel, MD  
UPMC

**Introduction:**

Biomarkers for chronic rhinosinusitis (CRS) are needed. Fractional exhaled nitric oxide (FeNO) is a cost-effective, noninvasive point-of-care test that has proven valuable in identifying patients with lower airway inflammation and predicting the likelihood of responsiveness to inhaled corticosteroid therapy in asthma. The utility of FeNO in upper airway disease, specifically in CRS, remains to be determined.

**Objective:**

The goal of this study was to test whether FeNO could serve as a noninvasive biomarker of sinonasal mucosal inflammation in CRS patients.

**Methods:**

Nasal mucus was obtained from 86 CRS patients and analyzed for cytokine expression using solid-phase sandwich ELISA. FeNO was obtained using a nitric oxide analyzer (NIOX VERO). 22-item Sinonasal Outcome Test (SNOT-22) scores were obtained at time of sample collection. Peripheral blood eosinophil and basophil counts were also evaluated. Linear regression with Pearson correlation coefficient was used to determine strength of relationship between variables.

**Results:**

CRS patients showed elevated FeNO levels with asthma (47.12 ± 5.21 ppb) or without asthma (43.24 ± 9.810 ppb). Elevated FeNO levels correlated with generalized sinonasal mucosal inflammation, as determined by increased levels of CCL26, TSLP, TNFα, and IL-17 in sinonasal mucus obtained from CRS patients. Furthermore, elevated FeNO levels selectively correlated with worsened SNOT-22 (P=0.0018), but did not correlate with eosinophilia or basophilia.

**Conclusions:**

FeNO levels correlated with increased sinonasal mucosal inflammation and symptom severity in CRS regardless of asthma status. FeNO measurements may serve as a quick and noninvasive biomarker in evaluating CRS patients.

9:13 AM - 9:20 AM

**Chronic particulate matter air pollution exposure is associated with anosmia: A Case: Control Study (R)**

Murrugappan Ramanathan, MD, FARS  
Nicholas Rowan, MD  
Zhenyu Zhang  
Jayant Pinto  
Shyam Biswal  
Niyall London, MD  
Johns Hopkins

**Introduction:**

Anosmia has profound implications on patient safety and quality of life. The fine particulate matter (PM2.5) component of air pollution may represent an olfactory insult that contributes to the development of anosmia, but has not been well studied. Our objective was to investigate the association between anosmia and long term PM2.5 exposure.

**Methods:**

Under IRB approval, adult patients with newly diagnosed anosmia by an otolaryngologist between January 2013 and December 2016 across a single health system were identified. Data from 538 patients with anosmia, without comorbid chronic rhinosinusitis (CRS), were compared to 2,152 age and gender-matched, healthy controls without anosmia or CRS. Cumulative PM2.5 exposure was estimated by a novel technique incorporating patients' residential zip codes into a deep learning neural networks model and conditional logistic regression was performed.

**Results:**

Mean age at diagnosis was 55 years and 73% were female. Mean exposure levels to PM2.5 were significantly higher in patients with anosmia as compared to healthy controls at all measured time points at 1, 2, 3, and 5 years preceding diagnosis. An increased odds of developing anosmia was associated with a 5 µg/m<sup>3</sup> increase of PM2.5 concentrations over all measured time points prior to diagnosis: one year (aOR=1.54, 95% CI:1.16-2.05), two years (aOR=1.63, 95% CI:1.24-2.14), three years (aOR=1.66, 95% CI:1.28-2.15), and five years (aOR=1.51, 95% CI:1.17-1.95).

**Conclusions:**

This large case control study demonstrates that long-term exposure to PM2.5 is associated with increased odds of developing anosmia. Ambient PM2.5 represents a potentially ubiquitous and modifiable risk factor for anosmia.

9:20 AM - 9:27 AM

**A new instrument for measurement of clinical outcome after lacrimal surgery: Tearing assessment and rating scale-12 (TEARS-12) (R)**

Jonathan Simmonds, MD  
Marianella Paz-Lansberg, MD  
Aria Jafari, MD  
Ashton Lehmann, MD  
Dara Bakar  
Ralph Metson, MD, FARS  
Massachusetts Eye & Ear

**Background:**

Currently no accepted validated instrument exists to measure clinical outcome in patients who undergo dacryocystorhinostomy (DCR). The objective of this study was to develop a quality of life questionnaire relevant to patients who present with nasolacrimal duct obstruction.

**Methods:**

Psychometric evaluations and expert opinion were utilized to construct a 12-question survey incorporating the most impactful symptoms of nasolacrimal duct obstruction. The survey was administered to 57 patients who underwent endoscopic DCR. Data was collected at two preoperative and one postoperative time points. Statistical analyses of internal consistency, responsiveness, and test-retest reliability were performed.

**Results:**

A significant improvement was found between the pre-operative and 1-week post-operative mean TEARS-12 scores [28.9 (SD 14.6) vs. 11.3 (SD 13.7), respectively,  $p=0.003$ ,  $t=3.736$ ]. The Cronbach's alpha value for the TEARS-12 was 0.92 indicating high internal consistency. Each question demonstrated internal reliability with a corrected item-total correlation greater than 0.30. The Pearson coefficient between the two pre-operative visit scores was 0.869 ( $p=0.001$ ) indicating high test-retest reliability.

**Conclusion:**

TEARS-12 is a valid, easy-to-use instrument to quantify the impact that lacrimal obstruction on quality of life and measure clinical outcome after DCR surgery.

9:27 AM - 9:32 AM

**Q&A**

9:32 AM - 9:47 AM

**Break**

9:47 AM - 10:27 AM

**Panel: Inclusive care for diverse rhinology patients (L)**

Moderator: Rodney J. Schlosser, MD, FARS  
Panelists: Jean Anderson Eloy, MD, FARS; Devyani Lal, MD, FARS; David Gudis, MD, FARS; Troy Woodard, MD, FARS

**Moderators: Stella Lee, MD; Daniel Beswick, MD, FARS; Do Yeon Cho, MD**

10:27 AM - 10:34 AM

**The relationship of bitter taste receptors and COVID-19**

Mohamed Darwish, MD  
Henry Barham, MD, FARS  
Christian Hall, MD  
Stephanie Broyles  
Megan Stevenson  
Brittany Zito  
Sinus & Nasal Specialists of Louisiana

**Introduction:**

Bitter taste receptors have been implicated in sinonasal innate immunity. Genetic variation conferred by polymorphisms in T2R genes associates with variation in upper respiratory pathogen susceptibility, symptomatology, and outcome.

**Method:**

A prospective cohort study from July 2020 through September 2020 followed subjects with evidence of lack of prior infection with SARS-CoV-2 who underwent study inclusion with T2R38 phenotype testing. Subjects were followed until infection with SARS-CoV-2 via PCR. Phenotype of T2R38 was re-tested after infection with SARS-CoV-2. The results were correlated with clinical course.

**Results:**

1935 subjects (mean 45.5 years; 56.9% female) participated, with 510 (26.4%) being non-tasters, 917 (47.4%) tasters, and 508 (26.3%) supertasters. Results suggest decreasing phenotypic expression with increasing age (mean ages of 41.6, 45.6, and 49.1 years among supertasters, tasters, and non-tasters, respectively;  $p<0.0001$ ). During the follow-up period, 266 (13.8%) subjects tested positive for SARS-CoV-2 via PCR. Non-tasters were significantly more likely to test positive for SARS-CoV-2 ( $p<0.0001$ ), to be hospitalized once infected ( $p=0.0055$ ), and to be symptomatic for a longer duration ( $p<0.0001$ ). The risk of infection and symptom duration showed significant evidence of linear trends across the tasting phenotypes.

**Conclusion:**

T2Rs play a role in the innate immune system. T2R38 polymorphisms may predict innate immune fitness toward and clinical course following SARS-CoV-2 infection. In our study, 85.5% of patients requiring inpatient admission were non-tasters. Conversely, supertasters represented 5.6% of patients infected with SARS-CoV-2, suggesting enhanced innate immune protection against SARS-CoV-2.

10:34 AM - 10:41 AM

**SARS-CoV-2 infection of human nasal mucosa in vitro is increased in CRSsNP**

Andrew Lane, MD, FARS  
Kathleen Kelly, MD  
Mengfei Chen  
Nicholas Rowan, MD  
Murrugappan Ramanathan, Jr., MD, FARS  
Andrew Pekosz  
Johns Hopkins School of Medicine

**Background:**

The causative virus of COVID-19, SARS-CoV-2, enters airway cells via the cell surface protein ACE2. Sinonasal epithelial cells have been shown at the mRNA and protein level to express ACE2, making them a likely target of initial infection. Many factors are believed to influence ACE2 expression and susceptibility to infection with SARS-CoV-2, includ-

ing the local inflammatory cytokine milieu. Here we used a turbinate explant model to study infectibility as a function of CRS phenotype.

#### Methods:

Portions of superior turbinate removed in the course of endoscopic sinus surgery from 13 subjects were immediately washed and placed in cell culture media. The tissue was exposed to 105 infectious units of SARS-CoV-2 for 6 hours, washed, and incubated for an additional 12 hours to allow viral replication. The tissue was then fixed in paraformaldehyde and prepped for immunohistochemistry. Immunostaining was performed to identify virus in infected cells. Cell counts were performed per mm of tissue surface.

#### Results:

Relative to the olfactory epithelium, infection of respiratory cells was sparse. The mean number of infected cells per mm was comparable between controls (n=3) and CRS with nasal polyps (n=5) explants but was significantly increased in CRS without nasal polyps (n=5) explants compared to either group.

#### Conclusion:

SARS-CoV-2 infects respiratory epithelial cells in human turbinate explants in vitro. The greater degree of infection in non-polyp CRS explants versus undiseased and CRS with nasal polyps explants is unclear, but may reflect disease-specific features, such as cytokine milieu or the effect of medical therapy.

10:41 AM - 10:48 AM

#### **Risks factors and characteristics associated with persistent smell loss with COVID-19 (R)**

Bitu Shahrivini  
Divya Prajapati  
Adam DeConde, MD  
Carol Yan, MD

#### Introduction:

Acute olfactory loss is a well-documented symptom of COVID-19, yet risk factors for persistent olfactory dysfunction remain poorly characterized. This study investigated demographic and clinical characteristics of COVID-19 patients with persistent measurable olfactory loss compared to those who recovered chemosensory function.

#### Methods:

A prospective, longitudinal study assessing olfactory function was conducted on PCR-positive ambulatory COVID-19 subjects using patient-reported olfactory symptoms (visual analogue scale, [VAS] 0=no smell, 10=normal) and the validated 12-item Brief Smell Identification Test (BSIT). Persistent smell loss was defined as >30 days of symptoms with BSIT ≤8 at last follow-up. Risks factors were evaluated using multivariate logistic regression.

#### Results:

52 COVID-19 subjects who reported smell loss were prospectively recruited and underwent serial quantitative testing to identify those with persistent loss. 42/52 (80.8%) patients demonstrated objective smell recovery (BSIT: 10.1±0.9, mean±SD) while 10/52 (19.2%) had persistent loss (BSIT: 6.4±2.4, p<.001) at last follow-up. Subjective olfactory scores (VAS) for the recovered and persistent smell loss groups were 5.7±2.9 and 2.8±3.1 (p=.011) at baseline, and 8.2±1.8 and 5.9±3.7 (p=.010) at last follow-up, respectively. Subjects with persistent loss still had both measured (BSIT:

+2.7±3.1) and subjective improvement (VAS: +4.2±3.3). Females were less likely to recover from COVID-19-associated smell loss (OR:0.068, 95%CI: 0.01-0.47, p=0.006). No other demographic, clinical, or symptom characteristics were associated with persistent smell loss.

#### Conclusion:

Female gender is associated with persistent smell loss in COVID-19-related anosmia.

10:48 AM - 10:53 AM

#### **Q&A (L)**

10:53 AM - 11:00 AM

#### **Ambient noise levels and wireless headsets for communication in aerosolizing otolaryngology surgery during COVID-19 (R)**

Marc Levin, MD  
Kelvin Zhou  
Ethan Sommer  
Tobial McHugh  
Doron Sommer  
University of Toronto

#### Background:

Noise in the operating room (OR) adversely affects health-care worker communication and patient outcomes. Measures employed to mitigate Coronavirus Disease 2019 (COVID-19) transmission including high-efficiency particulate air (HEPA) filters, and powered air-purifying respirators (PAPRs) contribute to higher ambient noise levels in the OR. Miscommunication during aerosol generating medical procedures (AGMPs), such as tracheotomy or skull base surgery can have serious consequences. This study describes and tests a strategy to overcome miscommunication in COVID-19 Otolaryngology ORs.

#### Methods:

Thirteen endoscopic sinus, four skull base, and one tracheotomy surgery were performed using PAPRs. In seven of these surgeries, OR team members donned headsets with microphones underneath their PAPRs linked via conference call on their mobile devices. Objective noise measurements and survey responses were obtained during/after each surgery.

#### Results:

Noise levels were problematic and caused communication issues intraoperatively as per 93% and 76% of respondents, respectively. Mean noise in COVID-19 ORs (73.8 decibels (dB)) was significantly higher when compared to historical non-COVID-19 OR noise data (70.2 dB) (p = 0.04). HEPA filters (59%) and Buffalo suction (18%) were identified as the main noise contributors. Implementation of the headset call strategy significantly improved communication in the OR (p=0.00).

#### Conclusion:

PAPRs and other measures protect surgical team members during AGMPs, however these strategies may impair health care worker communication. Linking OR team member headsets via a conference call is an inexpensive, and effective solution that improved OR communication during the COVID-19 pandemic.

11:00 AM - 11:07 AM

**Assessment of Patient Recognition of COVID-19-associated Olfactory Loss and Recovery – A Longitudinal Study (R)**

Divya Prajapati, BS  
 Bitu Shahrivini  
 Adam DeConde, MD  
 Carol Yan, MD  
 UC San Diego School of Medicine

**Introduction:**

The clinical course of COVID-19-related olfactory dysfunction remains poorly characterized, limited by self-reported measures and recall bias. As patients may fail to identify loss of smell, they may also not recognize their recovery. Objectively assessing the presence and duration of COVID-19 smell loss can guide management. We present a study of COVID-19 subjects that longitudinally correlated measured and subjective olfactory function.

**Methods:**

A prospective, longitudinal study evaluating subjective and measured olfactory function was conducted on ambulatory COVID-19 subjects. Patient-reported olfaction scores were obtained using visual analog scales (VAS, 0 = no smell, 10 = normal smell) and validated psychophysical testing using the 12-item Brief Smell Identification Test (BSIT). Repeated testing was performed weekly until smell recovery, defined as a BSIT $\geq$ 9/12 and VAS $\geq$ 8/10.

**Results:**

86 PCR-positive COVID-19 subjects were prospectively recruited  $\leq$ 3 days from diagnosis; 67 patients completed psychophysical testing. 29% (6/21) of subjects who reported no initial smell loss demonstrated olfactory loss on BSIT testing (<9/12), yet none subjectively recognized their impairment on longitudinal follow-up. 48% (22/46) of subjects with initial self-reported smell loss demonstrated early recovery (BSIT $\geq$ 9/12) at first testing, a mean of 8 $\pm$ 3.4 days after symptom onset. 72% (33/46) of subjects demonstrated recovery after 15.1 $\pm$ 11.6 days yet only 35% (12/34) subjectively recognized this.

**Conclusion:**

Smell loss tends to be an early COVID-19 symptom with measurable yet often unrecognized recovery for most patients within 1-4 weeks. This discrepancy may reflect a temporal delay in recognition or deficits besides odor identification.

11:07 AM - 11:14 AM

**Differential smell and taste outcomes in COVID 19: Single-center large population study (R)**

Nikita Chapurin, MD, MHS  
 Douglas Totten, BS  
 Naweed Chowdhury, MD  
 Spencer Dennis  
 Julia Brennan, MD  
 Rory Lubner, MD  
 Justin Turner, MD, PhD, FARS  
 Timothy Trone, MD  
 Rakesh Chandra, MD, FARS  
 Vanderbilt University Medical Center

**Background:**

Olfactory and taste dysfunction have been identified as key presenting symptoms for SARS-CoV2. Unfortunately, some patients develop long-term impairments, causing significant morbidity. We sought to elucidate factors associated with differential clinical trajectories.

**Methods:**

Cross-sectional study of patients testing positive for SARS-CoV2 PCR from a single tertiary-care institution. Demographics, comorbidities, subjective assessment of smell and taste function pre- and post-infection, and symptom duration were assessed. SNOT22 questionnaire was administered. Stepwise adjusted multivariate linear and logistic regression were used to identify possible predictors for symptom duration, severity, and persistence.

**Results:**

1,003 patients were included, with mean age of 44 years; 63% were female. Baseline taste and smell were normal in 93.8% and 91.4%, respectively, compared to only 52.0% and 46.6% post-diagnosis. Mean duration of smell loss was 19.7 days, but 6% reported symptoms lasting >60 days. Sore throat (OR1.60, 95%CI 1.13-2.26), GI symptoms (OR1.59, 1.12-2.25), prior smell disturbances (OR1.37, 1.04-1.78) and absence of fever (OR0.68, 0.48-0.97) were associated with moderate-to-severe smell problems at time of diagnosis. Lower BMI (beta=-0.04, p=0.013) and shortness of breath (b=7.54, p=0.001), but not age (b=0.077, p=0.286) or history of CRS (b=9.982, p=0.133), were significantly associated with duration of hyposmia and dysgeusia.

**Conclusions:**

Half of patients reported persistent olfactory and taste dysfunction after SARS-CoV2 infection, with sore throat, GI symptoms, prior smell dysfunction, and absence of fever correlating with symptom severity. Potential predictive factors should be studied prospectively.

11:14 AM - 11:20 AM

**Q&A (L)**

11:20 AM - 12:00 PM

**Panel: COVID-19 and rhinology: An international update (L)**

Moderator: Zara Patel, MD, FARS  
 Panelists: Carol Yan, MD; Claire Hopkins, MD; Leigh Sowerby, MD; Puya Dehgani-Mobaraki, MD; Benjamin Bleier, MD, FARS

12:00 PM - 1:00 PM

**Lunch/Visit with Exhibitors**

## Afternoon Session

### 1:00 PM - 5:00 PM CST

#### Room A

## Rhinology Education and Skull Base Updates

1:00 PM - 1:40 PM

### Panel: Current and future changes to rhinology education (L)

Moderator: Stacey Gray, MD, FARS

Panelists: Eugene Chang, MD, FARS; Elina Toskala, MD, FARS; Mark Tewfik, MD; David Poetker, MD, FARS

**Moderators: Waleed Abuzeid, MD; Adam DeConde, MD; Dana Crosby, MD, FARS**

1:41 PM - 1:48 PM

### Implementation of time-driven activity-based costing to analyze cost drivers in functional endoscopic sinus surgery (R)

Shravani Pathak, BA

Peter Filip, MD

David Lerner, MD

Andrey Filimonov, MD

Alfred Marc Iloreta, MD

Mount Sinai

#### Introduction:

The use of value-based costing structures is rising in importance as stakeholders look to prioritize value of care. New accounting methods like time-driven activity-based costing (TDABC) can provide an estimate of cost of resources consumed in the patient care pathway; we sought to use TDABC to calculate the cost of functional endoscopic sinus surgical (FESS) procedures at our institution and identify major cost drivers to target for future intervention.

#### Methods:

We performed a retrospective patient chart review of all procedures performed at our institution with the CPT code 31276 (Surgical Endoscopy with Exploration of Frontal Sinus and Removal of Tissue from Frontal Sinus). Fixed costs were retrieved via an in-house hospital database. Capacity cost rates for personnel were calculated by using national average salaries.

#### Results:

We completed TDABC analysis on 137 patient records. The calculated capacity cost rates were \$345.89/hr (ENT surgeon), \$294.12/hr (Anesthesiologist), \$23.83/hr (ENT resident), \$23.03/hr (Anesthesiology resident), and \$58.42/hr (nursing staff). The average total TDABC procedure cost was \$5,858.23, average personnel cost was \$3,320.25, and average supply cost was \$2,537.98 with one of the most expensive supplies being the Aquamantys.

#### Conclusion:

The TDABC model allows for analysis of cost drivers by considering the capacity of each resource. Personnel costs were the greatest cost drivers and reducing OR time while supporting patient outcomes may be more effective. Only direct costs were considered in our analysis but future investigation should include indirect costs. Greater transparency in all costs can provide an accurate understanding of the major factors that influence procedure costs.

1:48 PM - 1:55 PM

### Are NSAIDs effective enough for postoperative pain control after functional endoscopic sinus surgery and septoplasty: A randomized controlled study (R)

Alok Saini, MD

Zi Jiang

Starr Nicole

Jason Talmadge, MD

Isaac Schmale, MD

Jeffrey Radabaugh, MD

William Yao, MD, FARS

Amber Luong, MD, PhD, FARS

Martin Citardi, MD, FARS

University of Kentucky

#### Background:

Endoscopic sinus surgery (ESS) and septoplasty are commonly performed procedures without standardized post-operative pain regimens. There is an increased need to avoid opioids when possible given their potential for abuse. NSAIDs have been previously demonstrated to reduce or even obviate the need for opioid pain medications after rhinologic surgeries but prospective validation is limited.

#### Methods:

A randomized controlled study comparing the efficacy of diclofenac sodium to acetaminophen-hydrocodone following ESS with or without septoplasty. Participants were given a 100mm visual analog pain scale at 24, 48, 72, and 120 hours following ESS. Two-sample t-tests and multivariable logistic regression were used to compare pain scores between groups.

#### Results:

Seventy-five participants were enrolled; complete data was collected for 30 and 24 patients in the diclofenac and hydrocodone groups, respectively. Pain was greatest for both groups on postoperative day one. Pain scores did not differ between treatment groups on day 1 ( $p=0.187$ ), day 2 ( $p=0.626$ ), day 3 ( $p=0.473$ ), or day 5 ( $p=0.784$ ). Septoplasty was predictive of higher pain scores at 48 ( $p=0.003$ ), 72 ( $p=0.031$ ), and 120 hours ( $p=0.003$ ). A history of depression was predictive of higher pain scores at 48 hours ( $p=0.029$ ).

#### Conclusions:

Diclofenac sodium is non-inferior to hydrocodone-acetaminophen in controlling postoperative pain after ESS with or without septoplasty in opioid naïve patients without preexisting pain conditions. It is reasonable to consider diclofenac sodium as an alternative to opioid pain medication after rhinologic procedures.

1:55 PM - 2:02 PM

### Effect of nasal suction catheters on aerosol generation during endoscopic sinus surgery (R)

Alexander Murr, BS

Daniel Bacon

Princess Onuorah, BS

Abdullah Zeatoun, MD

Brian Thorp, MD, FARS

Adam Zanation, MD

Charles Ebert Jr., MD, FARS

Adam Kimple, MD, FARS

Brent Senior, MD, FARS

#### Background:

Airborne transmission of the SARS-CoV-2 virus remains a threat to patients and hospital employees. Recent observa-

tional data in clinic and the OR have identified focal aerosol generation with endonasal instrumentation during endoscopic sinus surgery. The primary aim of this prospective observational study is to assess the efficacy of a novel intranasal suction catheters in reducing aerosol generation during endoscopic sinus surgery.

#### Methods:

An optical particle sizer was used to measure particles <10 microns in diameter during endoscopic sinus surgeries. Aerosol measurements were collected during 14 traditional surgeries and in 12 surgeries after implementing use of an intraoperative nasal suction catheter (CoronaVac by Hemostasis; St. Paul, MN).

#### Results:

Compared to baseline aerosol concentrations, DBR use without a nasal suction catheter is associated with a mean increase of 302 particles/foot3 (95% CI 158 to 445;  $p < 0.0001$ ). Compared to baseline aerosol concentrations, nasal catheter suction during microdebrider use, is associated with a nonsignificant mean increase of 93 particles/foot3 (95% CI -18 to 204;  $p = 0.0994$ ). After adjusting for baseline aerosol concentrations, surgery with nasal catheter use is associated with a mean decrease of 300 particles/foot3 (95% CI -449 to -149;  $p < 0.0001$ ) compared to surgery without nasal catheter use.

#### Conclusion:

The use of a nasal catheter suction during microdebrider use is associated with a statistically significant decrease in mean aerosol concentrations. These findings suggest the use of nasal suction catheters can potentially lower aerosol generation and potentially reduce subsequent transmission risk.

2:02 PM - 2:09 PM

Postoperative care trends between fellowship and non-fellowship trained physicians following ESS: 2017 (R) Monica Kirolos, BS  
Michael Marino, MD, FARS  
Devyani Lal, MD, FARS  
Mayo Clinic Alix School of Medicine

#### Background:

With a shift in the medical field towards sub-specializing and post-residency training, it is imperative to evaluate the impact of fellowship training on patient care trends in rhinology. This study aims to compare the number and reimbursement of various procedures and visits between fellowship-trained (FTP) vs non-fellowship-trained (NTP) otolaryngologists for the calendar year 2017.

#### Methods:

The Medicare Provider Utilization and Payment Data from the Centers of Medicare and Medicaid Services was used to extract data for the following Current Procedural Terminology (CPT) codes: 31255 for total ethmoidectomy (anterior and posterior) and 31231 for diagnostic endoscopies. The data was compared between 30 rhinology fellowship and 50 non-fellowship trained otolaryngologists. The data set was randomized to account for gender and geographical differences. P-values were calculated after performing a two-tail t-test.

#### Results:

On average, FTP performed 284.9 endoscopies while NTP did 140.4 ( $p = 0.0037$ ) in the year 2017. FTP performed 8.7

total ethmoidectomies while NTP performed 1.88 procedures on average ( $p = 0.0005$ ) in the year 2017. FTP performed 69.67 debridement procedures while NTP did 36.92 ( $p = 0.0027$ ). The ratio of debridement procedures to ethmoidectomies (CPT 31237/CPT 31255) is 8.0 for FTP and 19.6 for NTP.

#### Conclusion:

Based on publicly available cohorted Medicare data, FTP performed more total ethmoidectomies and diagnostic endoscopies than NTP in the year 2017. However, the ratio of debridement procedures to ethmoidectomies for the FTP is lower than previously reported, suggesting that the CPT code 31237 is used equivalently by both FTP and NTP groups in Medicare patients undergoing total ethmoidectomy.

2:09 PM - 2:14 PM

**Q&A (L)**

**Moderators: Andrew Lane, MD, FARS; Charles Riley, MD; Kristine Smith, MD**

2:15 PM - 2:22 PM

**Endoscopic sinus surgery for chronic rhinosinusitis: 5-year clinical outcomes (R)**

Jonathan Simmonds, MD  
Marianella Paz-Lansberg, MD  
Ralph Metson, MD, FARS  
Massachusetts Eye & Ear

#### Objective:

To present the long-term data from a large prospective cohort of endoscopic sinus surgery patients.

#### Methods:

Patients with chronic rhinosinusitis (CRS) scheduled for endoscopic sinus surgery were asked to complete a survey before the procedure and at yearly intervals for five years thereafter. The survey contained the SinoNasal Outcomes Test-22 (SNOT-22), as well as the EuroQol 5-Dimension (EQ-5D), a general health-related quality of life questionnaire used across multiple medical specialties. Mixed effect modelling was used for univariate and multivariate analysis.

#### Results:

Among the 1203 patients enrolled in the ongoing study, a total of 334 patients have completed the baseline, 1-year, and 5-year surveys. The average preoperative SNOT-22 and EQ-5D scores were 47.81 and 0.829, respectively. The average SNOT-22 and EQ-5D scores improved at all subsequent time points, including one year [21.26 ( $p < 0.0001$ ) and 0.896 ( $p < 0.0001$ ), respectively] and five years [25.64 ( $p < 0.0001$ ) and 0.86 ( $p < 0.0001$ ) respectively]. Examined patient demographics, including gender ( $p = 0.786$ ), and comorbidities, such as smoking ( $p = 0.11$ ) and asthma ( $p = 0.299$ ), did not impact the observed degree of clinical improvement.

#### Conclusion:

Endoscopic sinus surgery is effective in improving the quality of life of patients with chronic rhinosinusitis in both the short- and long-term.

2:22 PM - 2:29 PM

**The relationship between socioeconomic status, exposure to airway pollutants and impact on chronic rhinosinusitis disease severity (R)**

Stella Lee, MD

Nathalia Velasquez, Resident Physician

Lauren A. Gardiner, Resident Physician

Tracy Z. Cheng, Resident Physician

John Moore, Research Coordinator

Robert M. Boudreau, Statistician

Alberta A. Presto, Associate Professor

UPMC

**Introduction:**

Air pollution directly interacts with airway mucosa, yet little is known how pollutants affect upper airway inflammation. Studies have shown increased incidence of chronic rhinosinusitis (CRS), rhinitis, and asthma in areas with higher traffic pollution and these neighborhoods are often associated with lower socioeconomic status (SES). The Area Deprivation Index (ADI) assesses neighborhood-level SES by zipcode. The purpose of this study is to assess the relationship of SES on exposure to inhaled pollutants and CRS disease severity.

**Methods:**

CRS patients with and without nasal polyps (CRSwNP, CRSsNP) were identified (total=234; CRSwNP=138; CRSsNP=96). Pollutant concentrations, including particulate matter 2.5 (PM<sub>2.5</sub>), black carbon (BC), and nitrogen dioxide (NO<sub>2</sub>) were measured at 70 sites within the defined county-wide sites and used to estimate patient exposures. SES was measured by ADI State Deciles. Disease severity metrics included the modified Lund-Mackay score (LMS), SNOT-22, systemic steroid therapy dose, and number of functional endoscopic sinus surgeries (FESS). Associations were analyzed and identified using linear, logistic and Poisson multivariable regression.

**Results:**

The distribution of CRSsNP and CRSwNP patients across ADI State Deciles was similar. ADI was predictor of exposure to airway pollutants (BC, PM<sub>2.5</sub>, and NO<sub>2</sub>) ( $p < 0.0001$ ) and increased steroid dosage ( $p = 0.01$ ) in both groups. NO<sub>2</sub> and BC were predictors of number of surgeries in CRSsNP and CRSwNP patients ( $p < 0.05$ ).

**Conclusion:**

Lower SES predicted higher exposure to air pollution and disease severity in patients with CRS as demonstrated by increased systemic steroid treatment. NO<sub>2</sub> and BC may play a role in refractory sinus disease.

2:29 PM - 2:36 PM

**The association between modified frailty index and postoperative outcomes in endoscopic sinus surgery (R)**

Khodayar Goshtasbi, MS

Jack Birkenbeuel, Medical Student

Brandon Lehrich, Medical Student

Arash Abiri

Peter Papagiannopoulos, MD

Bobby Tajudeen, MD, FARS

Edward Kuan, MD, FARS

University of California Irvine School of Medicine

**Objectives:**

To assess whether preoperative frailty can predict short-term outcomes following endoscopic sinus surgery.

**Methods:**

The 2005-2017 ACS-NSQIP database was queried for 30-day post-operative outcomes of patients undergoing endoscopic sinus surgery, extracted by CPT codes 31237, 31240, 31253, 31254, 31255, 31256, 31257, 31259, 31267, 31276, 31287, 31288. Five-item modified frailty index (mFI) was calculated based on the history of diabetes, COPD, CHF, chronic hypertension, and functional status.

**Results:**

A total of 1421 patients (48.7% female, 77.5% white) were included with a mean age of  $46.0 \pm 16.6$  years. mFI had a positive correlation with both age ( $R = 0.459$ ,  $p < 0.001$ ) and ASA score ( $R = 0.428$ ,  $p < 0.001$ ). Compared to patients with mFI=0 ( $n = 882$ ), patients with mFI  $\geq 1$  ( $n = 539$ ) had longer operation time ( $137.8 \pm 122.9$  vs.  $154.7 \pm 142.1$  minutes,  $p = 0.018$ ), longer length of stay (LOS) ( $1.2 \pm 2.6$  vs.  $2.2 \pm 3.9$ ,  $p < 0.001$ ), and higher rates of readmission (2.9% vs. 5.1%,  $p = 0.049$ ), medical complications (3.6% vs. 9.5%,  $p < 0.001$ ), and discharge to non-home facility (DNHF) (1.9% vs. 4.8%,  $p = 0.003$ ). Patients with mFI  $\geq 1$  had significantly higher likelihood of experiencing medical complications (odds ratio [OR]=1.7,  $p = 0.047$ ) and LOS  $\geq 2$  (OR=1.4,  $p = 0.019$ ) even after adjusting for age and ASA score as possible confounders.

**Conclusion:**

The 5-point mFI can be a valuable predictor of short-term surgical outcomes following endoscopic sinus surgery. The ability of mFI to predict post-operative outcomes in endoscopic sinus surgery compared to ASA score and age should be further investigated.

2:36 PM - 2:43 PM

**Long-acting implantable corticosteroid matrix for chronic rhinosinusitis: Results of LANTERN Phase 2 randomized controlled study (R)**

Yina Kuang, PhD

*Presented by Anders Cervin, MD, PhD*

Joanne Rimmer

Agnieszka Wrobel

Yogen Abelak

Lindsay Brayton

Lyra therapeutics, Inc.

Watertown, MA

**Background:**

Topical steroids are first-line treatment for chronic rhinosinusitis (CRS), but fail to provide adequate symptom control for all patients. Designed for medical treatment failures, LYR-210 is an implant that locally elutes mometasone furoate to inflamed sinonasal tissue for 24 weeks in surgically naïve CRS patients with and without nasal polyps. In an open-label Phase 1 study, LYR-210 demonstrated clinically relevant improvement in the 22-item Sinonasal Outcome Test (SNOT-22). The safety and efficacy of LYR-210 in CRS was further evaluated in the LANTERN Phase 2 study.

**Methods:**

Sixty-seven surgically naïve adult CRS patients who failed previous medical management and were seeking further treatment were enrolled in a multicenter, blinded, controlled, dose-ranging study. Patients had moderate-to-severe disease based on SNOT-22 and composite 7-day average scores of the 4 cardinal CRS symptoms (4CS), with diagnosis confirmed by nasal endoscopy and MRI. Patients were

randomized (1:1:1) to saline-irrigation only control or bilateral in-office administration of LYR-210-2500µg or LYR-210-7500µg. Safety and efficacy were evaluated over 24 weeks.

**Results:**

Both LYR-210 doses were safe and well-tolerated over the 24-week treatment period. LYR-210 demonstrated rapid and durable dose-dependent symptom improvement based on 4CS and SNOT-22, with LYR-210-7500µg achieving statistical significance as early as 8 weeks and out to 24 weeks compared to control. In addition, LYR-210-7500µg reduced radiographic inflammation in the ethmoid sinuses of patients.

**Conclusions:**

LYR-210 is the first nasal implant to achieve up to 24 weeks of benefit from a single administration in surgically naïve CRS patients with and without nasal polyps.

2:43 PM - 2:48 PM

**Q&A (L)**

2:48 PM - 3:05 PM

**Break**

**Moderators: Jean Kim, MD, FARS; Garret Choby, MD, FARS; Victoria Lee, MD**

3:05 PM - 3:12 PM

**Racial, ethnic, and gender disparities in registered clinical trials for chronic rhinosinusitis with nasal polyposis (R)**

Daniel Spielman, MD  
Rodney Schlosser, MD, FARS  
Andi Liebowitz  
Rahul Sharma  
Jonathan B. Overdevest, MD, PhD  
Jose Mattos, MD  
David Gudis, MD, FARS  
New York Presbyterian Hospital

**Objective:**

The aim of this study is to assess the racial, ethnic, and gender demographics of patients enrolled in clinical trials registered with the National Institutes of Health (NIH) evaluating chronic rhinosinusitis with nasal polyposis (CRSwNP) relative to the demographics of the United States (U.S.) population.

**Methods:**

ClinicalTrials.gov, the database maintained by the NIH's National Library of Medicine, was reviewed to identify all prospective clinical trials on CRSwNP evaluating medical therapies. Individual study and pooled data were compared to national U.S. census data.

**Results:**

Eighteen studies were included, comprising 4,125 patients evaluating: Dupilumab, Mepolizumab, Omalizumab, Fluticasone/Optinose, Medihoney, Mometasone, and Sinuva. 42.7% were female and the mean age was 46.8 years. Of the 4,125 patients, 69.6% were identified as White, 6.6% as Black, 20.8% as Asian, 0.1% as Pacific Islander, 0.4% as American Indian, 8.0% as Hispanic, and 2.4% were classified as Other. The racial, ethnic, and gender composition of the pooled study population differs significantly from national U.S. census data with underrepresent-

ation of Black, Hispanic, Pacific Island, and American Indian individuals as well as females ( $p < 0.05$ ). Medication class sub-analyses yielded variable results.

**Conclusion:**

The racial, ethnic, and gender demographics of patients enrolled in CRSwNP clinical trials registered with the NIH differ significantly from the demographics of the U.S. population. Demographic heterogeneity between treatment and study populations may affect the generalizability of the study results. Proactive efforts to enroll representative populations should be emphasized across all levels of rhinology research.

3:12 PM - 3:19 PM

**Diagnosis and management of barosinusitis: A systematic review (R)**

Tiffany Chen, BA  
Shivani Pathak  
Ellen M. Hong  
Brian Benson  
Andrew P. Johnson  
Peter F. Svider

**Background:**

Various treatments for barotrauma to the sinuses, defined as injury or inflammation that occurs secondary to uncompensated changes in ambient pressure, have been proposed, however there is no consensus amongst the literature.

**Methods:**

A systematic review of PubMed/MEDLINE, EMBASE and Cochrane Library was conducted. Twenty-seven articles encompassing 232 patients met inclusion and were queried for demographics, etiology, presentation, and treatments.

**Results:**

Mean patient age was 33.3 years, where 21.7% were female. Causes of barotrauma include diving (57.3%), airplane descent (26.7%) and general anesthesia (0.4%). The most common presentations were frontal pain (44.0%), epistaxis (25.4%) and maxillary pain (10.3%). Most patients received topical steroids (44.0%), oral steroids (28.4%), decongestants (20.7%) and antibiotics (15.5%). For surgical treatment, most patients underwent functional endoscopic sinus surgery (FESS) (49.6%). Adjunctive surgeries include middle meatal or maxillary antrostomy (20.7%), septoplasty (15.5%) and turbinate surgery (9.1%). The most efficacious medical treatments are as follows: 63.6% success rate with oral steroids (66 treated), 50.0% success rate with topical steroids (102 treated), and 50.0% success rate analgesics (10 treated). For surgical treatments received by greater than 10% of the sample, the most efficacious was FESS (91.5% success rate, 108 treated).

**Conclusion:**

Oral and topical steroids should be first line therapies for acute barotrauma to the sinuses. If refractory, then functional endoscopic sinus surgery is an effective treatment.

3:19 PM - 3:26 PM

**Marsupialization with a mucosal graft reduces recurrence after endonasal surgery of Rathke's cleft cyst (R)**

Mandy Salmon, BS  
 Tapan Patel  
 Aman Prasad  
 Elizabeth Munke Stevens  
 Kathleen Davin  
 Heather Ungerer  
 James Palmer, MD, FARS  
 Nithin Adappa, MD, FARS  
 University of Pennsylvania

**Objectives:**

Rathke's cleft cysts (RCC) arise from the development of the Rathke's cleft pouch. These commonly occurring cysts are typically asymptomatic, but sometimes present with headaches, endocrine dysfunction, and visual loss. Recurrence is common after either drainage or surgical removal. The endoscopic endonasal approach (EEA) is increasingly utilized for management of RCC. Surgical goals include drainage and marsupialization of the cyst. Various techniques have been described to try to reduce the rates of recurrence. We studied the effect of mucosal grafting via a nasoseptal flap on recurrence.

**Methods:**

Patients who underwent EEA for RCC at a tertiary care center between 2012 and 2019 were identified and divided into 2 cohorts: Mucosal versus no mucosal reconstruction. Surgical approach, reconstructive method, and recurrence were recorded. Primary endpoint was symptomatic or radiographic recurrence.

**Results:**

16 patients were identified undergoing surgeries. A small customized nasal septal flap was used to line the cyst cavity in 8 cases. Drainage without mucosal reconstruction was performed in the remaining 8 cases. Four patients developed recurrences and all four of them elected to undergo revision surgery. All recurrences occurred in cases where no mucosal flap was used, demonstrating decreased recurrences with mucosal reconstruction ( $p < 0.05$ ).

**Conclusions:**

Utilization of mucosa to partially line a drainage pathway after EEA for RCC reduces recurrence rates.

3:26 PM - 3:33 PM

**The effect of obstructive sleep apnea on surgical outcomes of orbital decompression for thyroid eye disease (R)**

Tory McKnight, BS  
 Glen D'Souza, MD  
 Chandala Chitguppi, MD  
 Vivian Xu  
 Alexa Cohen  
 Marisa Wu  
 Theodore Klug, MD, MPH  
 Gurston Nyquist, MD, FARS  
 Marc Rosen, MD, FARS  
 Michael Rabinowitz  
 Mindy Rabinowitz, MD, FARS  
 Thomas Jefferson University

**Introduction:**

Many cases of thyroid eye disease (TED) involve intractable adnexal changes requiring either urgent or elective surgical orbital decompression (OD). It is not known if obstructive

sleep apnea (OSA) impacts outcomes following OD. This study compared surgical outcomes in patients (pts) with and without OSA following OD for TED.

**Methods:**

A retrospective chart review of pts with TED who underwent OD between 2010-2020 at a single tertiary care institution was done. Pts were stratified as known OSA (Group K; documented clinical history), suspected OSA (Group S; STOP BANG score  $> 3$ ), and no OSA (Group N; STOP BANG score  $< 3$  or negative sleep studies). Groups K and S were combined for analysis (Group KS) and compared to group N with Chi square or Fisher's exact test.

**Results:**

Sixty-five pts were included in the study. The majority were white ( $n=43$ , 66%) and female ( $n=47$ , 72%). Thirty-two % ( $n=24$ ) were in group KS, and 68% ( $n=41$ ) in group N. Extraocular muscle involvement at pre-op CT was similar between KS and N (mean 5.9 vs. 5.8 muscles). The incidence of pre-op diplopia was higher in KS ( $n=18$ , 90%) than N ( $n=21$ , 67%) and approached significance ( $p=0.059$ ). Pts in group KS were more likely to report persistent diplopia at one year post-op ( $n=18$ , 86% vs  $n=3$ , 10%;  $p=0.000003$ ).

**Conclusion:**

The effect of OSA on OD outcomes in pts with TED is unknown. These early data suggest that pts with known or suspected OSA may have worse outcomes and more persistent ocular/orbital signs and symptoms after OD than pts without OSA. The limitations of this study include its small sample size, the disproportionate size of the "non-OSA" group, its retrospective nature and challenges of incomplete data. Further investigation is required.

3:33 PM - 3:38 PM

**Q&A (L)**

**Moderators: Marilene Wang, MD, FARS; Mathew Geltzeiler, MD, FARS; Gretchen Oakley, MD, FARS**

3:39 PM - 3:46 PM

**Race, disease-specific survival, and conditional survival in primary sinus malignancies (R)**

Rahul Sharma, BS  
 Rodney Schlosser, MD, FARS  
 Jonathan B. Overvest, MD, PhD  
 Daniel Beswick, MD, FARS  
 Jeffrey Suh, MD  
 Kibwei McKinney, MD  
 David Gudis, MD, FARS  
 Columbia University Irving Medical Center

**Background:**

Racial disparities in survival have been identified for many different types of cancer. Causes are likely multifactorial. We aim to characterize 5-year conditional disease-specific survival (CDSS), or how survival changes with increasing survivorship, and disease-specific (DSS) survival by race in patients with sinus cancer, as well as likelihood of undergoing surgery when recommended.

**Methods:**

Patients diagnosed with sinus cancer between 1973-2015 were extracted from the Surveillance, Epidemiology, End Results (SEER) registry. Kaplan-Meier statistics for DSS were stratified by race. Cox-proportional hazards regression

models predicting DSS were generated controlling for stage, age, and race. CDSS was calculated based on hazard models. Logistic regression predicting not receiving surgery when recommended was conducted controlling for race, stage, and age.

#### Results:

Analysis included 5,096 patients and most were White (66%). DSS was significantly different when stratified by race ( $p < 0.01$ ). Non-Hispanic Black (HR 1.24, CI 1.09-1.41,  $p < 0.01$ ) and 'Other' (HR 1.84, CI 1.32-2.56,  $p < 0.01$ ) patients had worse DSS compared to White patients after controlling for stage and age at diagnosis. Non-Hispanic Blacks had worse CDSS primarily in regional and distant staged cancer compared to other races. The 'Other' race category had worse CDSS in all stages. Patients of 'Other' race were significantly less likely to receive surgery when recommended (OR 2.46, CI 1.11-4.86,  $p = 0.02$ ) compared to White patients.

#### Conclusion:

The impact of race on CDSS has been understudied. Race significantly impacts both DSS and CDSS in patients with sinonasal cancer. The causes for these disparities are likely multifactorial.

3:46 PM - 3:53 PM

#### **Factors associated with delivery of postoperative radiotherapy at a different facility in sinonasal cancer (R)**

Jeff Gao, BS  
Christopher Tseng  
Gregory Barinsky  
Christina Fang, MD  
Jordon Grube, MD  
Wayne D. Hsueh, MD  
Jean Anderson Eloy, MD, FARS  
Rutgers New Jersey Medical School

#### Objective:

To investigate factors associated with delivery of postoperative radiotherapy (PORT) at a different facility from the location of surgery for sinonasal squamous cell carcinoma (SNSCC).

#### Methods:

The National Cancer Database was queried for patients with SNSCC between 2004-2016 who underwent surgery at an academic hospital and received PORT. Cases were divided into those that underwent PORT at the same facility as the surgery and those that did not. Univariate and multivariate analyses were used to examine characteristics associated with delivery of PORT at an outside facility.

#### Results:

1,622 cases of SNSCC treated with surgery at an academic institution were identified, of which 1,050 underwent PORT at the same facility as the surgery, and 572 underwent PORT at a different facility. Population density, income quartile, education level, and adjuvant chemotherapy were significantly associated with delivery of PORT at another facility. Age, sex, race, and insurance were not associated with PORT at an outside facility. Accounting for significant variables, patients who underwent adjuvant chemotherapy were less likely to receive PORT at an outside facility (OR 0.76,  $p = 0.024$ ). Living greater than 30 miles (OR 4.01,  $p < 0.001$ ) away from the surgical treatment facility was associated with PORT at an outside facility. Patients who underwent PORT at an outside facility had lower, but not statistically

significant, 5-year overall survival than those who received it at the surgical hospital (52.4% vs. 55.9%,  $p = 0.094$ ).

#### Conclusion:

Living greater than 30 miles away from the surgical facility was associated with PORT at another facility. PORT at an outside facility was not significantly associated with decreased survival in SNSCC.

3:53 PM - 4:00 PM

#### **Trends in HPV testing for patients with sinonasal squamous cell carcinoma: A national analysis (R)**

Christopher Tseng, BS  
Jeff Gao  
Gregory Barinsky  
Christina Fang  
Jordon Grube  
Wayne Hsueh  
Jean Anderson Eloy, MD, FARS  
Rutgers New Jersey Medical School

#### Objective:

To analyze national trends in human papillomavirus (HPV) testing for patients diagnosed with sinonasal squamous cell carcinoma (SNSCC).

#### Methods:

Cases with a primary SNSCC diagnosis and available HPV testing status were extracted from the National Cancer Database from 2010-2016. Univariate and multivariate analyses were performed to assess differences in socioeconomic, hospital, and tumor characteristics between HPV tested and non-tested patients.

#### Results:

A total of 2308 SNSCC cases were identified, of which 1210 (52.4%) were HPV tested and 1098 (47.6%) were non-tested. On univariate analysis, age, insurance status, median income quartile, population density, treatment facility location, and tumor grade were found to be significantly associated with HPV testing. Gender, race, Charlson-Deyo comorbidity score, treatment facility type, tumor primary site, and clinical stage were not significantly associated with HPV testing. On logistic regression, living in a non-rural metropolitan area had lower odds of HPV testing compared to urban areas (OR 0.74,  $p = 0.041$ ), while tumor grade III/IV had higher odds of being tested than grade I (OR 1.73,  $p < 0.001$ ). Those who underwent HPV testing had higher 5-year overall survival than non-tested patients, but this was not statistically significant (48.3% vs 45.3%, log-rank=0.405).

#### Conclusion:

Among SNSCC patients, presence of tumor grade of III/IV increased the likelihood of HPV testing, while living in a non-rural metropolitan area lowered odds of testing. There was no overall survival difference between cases which were tested and not tested for HPV.

4:00 PM - 4:07 PM

**Can indocyanine green fluorescence angiography predict skull base reconstructive flap necrosis? (R)**

Uma Ramaswamy, MD

Eric Wang, MD, FARS

Carl Snyderman, MD

University of Pittsburgh Medical Center

**Background:**

Applications of indocyanine green fluorescence angiography (ICGFA) have recently been explored in endoscopic skull base surgery (ESBS); however, its putative role in predicting intranasal flap loss is unclear.

**Methods:**

Retrospective review of patients enrolled in IRB-approved skull base ICGFA protocol assessed ICG fluorescence before and/or after harvest of reconstructive flaps (nasoseptal and lateral nasal wall) during ESBS. Fluorescence patterns (flap pedicle and/or body enhancement) and other factors were studied in relation to flap necrosis.

**Results:**

ICGFA was utilized in 43 patients. 28 patients underwent primary ESBS, and 15 underwent revision surgery. Rate of flap necrosis was 4/43 (9%), with an average time to diagnosis of 15 days. Necrosis occurred in 2/15 revision cases (13%) and 2/28 primary cases (7%). 1/4 (25%) of necrotic flaps did not enhance with ICG when initially harvested; 1 flap's pedicle enhanced and 2 flaps fully enhanced. Of 39 ultimately viable flaps, 4 lacked ICG perfusion when harvested. All patients with flap necrosis had large clival defects. 3/4 (75%) had fat grafts. 1 patient had a surgical site infection; this patient also had a fat graft. None appeared to be nutritionally compromised based on normal prealbumin.

**Conclusion:**

Lack of ICG fluorescence was predictive of flap necrosis in only 25% of cases. While ICGFA is a useful tool to assess intraoperative arterial inflow, it does not appear to be the sole determinant in flap survival. Perfusion was adequate even in revision cases where the pedicle could be compromised, again suggesting factors other than arterial flow affect flap healing. Further studies are necessary to specifically correlate these other factors with flap necrosis.

4:07 PM - 4:12 PM

**Q&A (L)**

4:15 PM - 5:00 PM

**Panel: Beyond "I can do it endoscopically": Enhancing patient care in the current era of skull base surgery (L)**

Moderator: Richard Harvey, MD, FARS

Panelists: Brian Thorp, MD, FARS; Corinna Levine, MD,

FARS; Nicholas Rowan, MD

## Afternoon Session

1:00 PM - 5:00 PM CST

### Room B

## Advances in Inflammatory Disease

**Moderators: Cecelia Damask, DO; Jonathan Ting, MD, FARS; Eric Wang, MD, FARS**

1:00 PM - 1:07 PM

**Resonant vibration of the sinonasal cavities for the treatment of nasal congestion (R)**

Ashoke Khanwalkar, MD

Jacob Johnson

Wendy Zhu

Ezekiel Johnson

Bryant Lin

Peter Hwang, MD, FARS

Stanford

**Introduction:**

Humming has been shown to be therapeutic for sinonasal symptoms. A novel wearable vibrational device tuned to an individual's sinonasal resonant frequencies holds promise to treat nasal congestion. We evaluated safety and efficacy of this device in a series of patients with acute nasal congestion.

**Methods:**

21 patients with a minimum nasal congestion score  $\geq 2$  (0-3) on the Total Nasal Symptom Score (TNSS) were recruited. A 3D smartphone facial scan was used to determine each individual's sinonasal resonant frequency. Subjects received two sequential 10-minute treatments with the device. Total nasal symptom score (TNSS), visual analog scale (VAS) for facial pain, and VAS for headache were assessed at baseline and after each treatment.

**Results:**

Of a total of 21 patients, 71.4% demonstrated improvement in TNSS after a single 10-minute treatment, and 85.7% improved after 20 total minutes of treatment. TNSS mean at baseline was 4.95, after 10 mins reduced to 3.43, and after 20 mins further reduced to 2.57 ( $p < 0.0001$ ). Mean nasal congestion subscore was 2.14 at baseline, 1.86 after 10 mins, and 1.43 after 20 mins ( $p < 0.0001$ ). Facial pain VAS mean at baseline was 1.63, after 10 mins reduced to 1.49, and after 20 mins further reduced to 0.95 ( $p = 0.22$ ). Headache VAS was 1.11 at baseline, 0.91 after 10 mins, and 0.73 after 20 mins ( $p = 0.43$ ). There were no reported adverse events.

**Conclusion:**

This novel personalized vibrational device can be safely used and has shown promise in the treatment of acute nasal congestion.

1:07 PM - 1:14 PM

**Baseline subjective and objective measures in patients with allergic rhinitis: A systematic review (R)**

Andraia Li, BS  
Kathy Zhang  
Priyanka Reddy  
Shaun Nguyen  
Jacob Fried  
Rodney Schlosser, MD, FARS  
Medical University of South Carolina

**Objective:**

The goal of this study is to establish normative baseline values for patient-reported outcomes (PROMs) and objective measures across the published literature in allergic rhinitis (AR).

**Methods:**

A systematic search of databases was performed to identify studies with RQLQ, TNSS and VAS scores, and objective measures such as PNIF and nasal airflow. PROMs and objective outcomes were pooled as weighted means and 95% confidence interval (CI). A weighted correlation was performed to assess the relationship between PROMs and objective outcomes. Duration of disease as a predictor for PROMs was assessed using meta-regression.

**Results:**

A total of 175 studies reporting on 33,824 patients were included in the systematic review. Weighted mean [95% CI] of pooled PROMs were 7.41 [7.11-7.71] for TNSS, 5.40 [5.16-5.65] for VAS, 2.95 [1.92-3.07] for RQLQ and objectively, 118 [112-123] L/min for PNIF and 463.1 [434.4-491.8] cm<sup>3</sup>/sec for nasal airflow. Subgroup analysis stratified by current and previous AR classification showed significant differences between seasonal (8.89 [8.58-9.20]) vs perennial (7.25 [6.78-7.72], p<.001) AR on TNSS and between the four ARIA classes (p<.001) with scores ranging from 2.65 to 6.53 on VAS. There was no significant correlation between PROMs and objective measures. Meta-regression identified a negative linear relationship between duration of disease and RQLQ (r=-0.47, p<.001).

**Conclusions:**

Symptom severity scores differ between the current and previous classifications of allergic rhinitis. Patient-reported symptom severity and quality of life do not correlate with objective measures of nasal patency. RQLQ significantly decreases with disease duration, reflecting improved quality of life over time.

1:14 PM - 1:21 PM

**Hypothalamic-Pituitary-Adrenal (HPA) axis suppression and longterm intra-nasal corticosteroid use: A systematic review and metaanalysis (R)**

Amirpouyan Namavarian  
Gianluca Sampieri  
Amr Hamour  
Jongwook Lee, MD  
John Lee, MD  
University of Toronto

**Introduction:**

Intranasal corticosteroids (INCS) are used in the management of chronic rhinosinusitis and allergic rhinitis. Use of exogenous steroids is associated with hypothalamic-pituitary-adrenal axis dysfunction and adrenal insufficiency (AI). We aimed to estimate the rate of AI after INCS use in a

meta-analysis, stratified by steroid type and treatment duration.

**Methods:**

Systematic review of Medline, Embase, Pubmed, Web Of Science and CINAHL databases from inception until 2020 was completed to identify all studies investigating INCS use and AI. Study design followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. AI was defined as AM serum cortisol <550 nmol/L. INCS type was classified as first (beclomethasone dipropionate, triamcinolone acetonide, beclomethasone, budesonide) and second (ciclesonide, mometasone furoate, and fluticasone propionate) generation. Duration of treatment was classified as short (<1 month), medium (1-6 months) and long term (>6 months) time periods.

**Results:**

Of 5726 articles identified, 34 studies (2049 patients) were included in the final analysis. The rate of AI was 0.8% (95% CI, 0.4-1.2%) in all individuals. Stratified by type, AI was observed in 1.2% (95% CI, 0.5-1.95%) first generation and 0.17% (95% CI, -0.1-0.5%) second generation steroids (p=0.015, CI 0.1-2%). AI was seen in 1.4% (95% CI, -0.2-3.1%) of long-term, 2.2% (95% CI, 0.8-3.6%) medium and 0% short duration use of INCS.

**Conclusion:**

Overall, the use of INCS carries a low risk for AI. Though modest, the risk of AI may differ depending on the length of duration and type of steroids. Informing patients of these risks is of importance for the treatment of chronic sinonasal conditions.

1:21 PM - 1:28 PM

**Radiological assessment of high anterior septal deviation and its impact on sinus access (R)**

Joshua Lee, MD  
Victoria Wu  
Burce Ozgen  
Victoria Lee, MD  
University of Illinois at Chicago

**Objective:**

High anterior septal deviation is an underreported anatomic variant that can affect the decision to perform septoplasty for access during sinus surgery and ease of postoperative debridement. This study aims to 1) describe an objective method of assessing high anterior septal deviation, and 2) explore its prevalence and clinical implications for performing septoplasty.

**Methods:**

Computed tomography of the sinuses from 2016 to 2020 obtained via a standardized imaging protocol were retrospectively reviewed. Two independent observers measured the following with respect to midline: distance to septal cartilage (SDDc), distance to lateral nasal wall (LNW), and septal deviation angle (SDA).

**Results:**

Interrater reliability was excellent across 89 patients, with intraclass correlation coefficients of 0.9 [0.8-0.9] for SDDc, 0.8 [0.8-0.9] for SDDc/LNW, and 0.9 [0.9-1.0] for SDA. Median SDDc was 2.3 mm [1.6-3.3], SDDc/LNW was 0.2 [0.2-0.3], and SDA was 8.4° [5.3°-10.7°]. Of these 89 patients, 44 underwent sinus surgery, with 14 patients receiving septoplasty for surgical access. Comparing patients who did or did not undergo septoplasty, those who

did had a significantly greater median SDDc (2.9 mm [1.9-4.4] vs 2.0 mm [1.5-2.9],  $p=0.04$ ) and SDA ( $10.2^\circ$  [7.5-12.2] vs  $6.7^\circ$  [4.9-9.3],  $p=0.02$ ). Comparison of SDDc/LNW between groups approached significance (0.3 [0.2-0.4] vs 0.2 [0.1-0.3],  $p=0.07$ ).

#### Conclusion:

The methods described herein can reliably assess high anterior septal deviation. A SDDc of 2.9 mm or SDA of  $10.2^\circ$  may indicate a clinically significant deflection prompting consideration of septoplasty for access during sinus surgery. Future investigations will focus on the validation of these measurements in a larger cohort.

1:28 AM - 1:33 PM

#### Q&A (L)

**Moderators: Christine Franzese, MD, FARS; Naweed Chowdhury, MD; Arthur Wu, MD, FARS**

1:34 PM - 1:41 PM

#### **Inhibiting the TH2 pathway with dupilumab causes a shift to type 1 inflammatory cytokine production (R)**

Stella Lee, MD

Jymirah Morris, Medical Student

Tolani Olonisakin, Medical Student

John Moore, Research Coordinator

Sally Wenzel, MD

UPMC

#### Introduction:

Chronic rhinosinusitis with nasal polyps (CRSwNP) has been associated with elevation of local and systemic TH2 cytokines such as IL4, IL-5, and IL-13. The biologic agent dupilumab—an inhibitor of type 2 inflammation via inhibition of IL-4R $\alpha$ —is an effective adjunct treatment for refractory cases of CRSwNP. The mechanism of how the inhibition of these TH2 cytokines leads to a shift in the inflammatory milieu is incompletely understood.

#### Objective:

The purpose of this study was to determine whether treatment of CRSwNP with dupilumab leads to a shift from a type 2 inflammatory response to increased TH1 cytokine expression. Methods: Inflammatory biosignatures of CRSwNP were collected via sinonasal mucous supernatant pre-treatment with dupilumab, as well as post-treatment ( $\geq 3$  months). Inflammatory cytokines—IL-4, IL-5, IL-13, IL-18, CXCL8/IL-8, TNF- $\alpha$ , IFN- $\gamma$ , CCL2, and CCL5—were measured using Sandwich ELISA. Patients with positive sinonasal cultures at time of mucus collection were excluded to rule out alternative sources of inflammation.

#### Results:

Fifteen patients were included. Pre-Dupilumab therapy, there were elevated levels of type 2 cytokines, IL-4, IL-5, and IL-13. Dupilumab therapy led to a significant increase in nasal mucus IL-18 production ( $p=0.0023$ ), a strong inducer of IFN- $\gamma$ . A trend was also seen toward increased levels of CXCL8/IL-8 ( $p=0.08$ ). TNF- $\alpha$  and IFN- $\gamma$ , however, were almost undetectable regardless of dupilumab treatment time. There were no significant differences in the pre- and post-treatment measurements of CCL2 ( $p=0.33$ ) or CCL5 ( $p=0.89$ ).

#### Conclusion:

Dupilumab appears to lead to increased production of TH1

cytokines IL-18 and CXCL8/IL-8 in nasal mucosa of patients with CRSwNP.

1:41 PM - 1:48 PM

#### **Treatment outcomes of AERD (Aspirin Exacerbated Respiratory Disease) patients treated with aspirin desensitization (AD), biologics (B) or both biologics and desensitization (BD) therapy (R)**

Glen D'Souza, MD

Uche Nwagu, BA

Rohan Ganti, BA

Prachi Patel, BA

Chandala Chitguppi, MD

Blair Barton, MD

Mindy Rabinowitz, MD, FARS

Marc Rosen, MD, FARS

Jessica Most, MD

Elina Toskala, MD, FARS

Thomas Jefferson University Hospital

#### Methods:

A single-institution retrospective study that analyzes patient demographics, SNOT 22 scores, FENO values, absolute eosinophil counts (AEC), serum IgE levels (S.IgE), treatment duration, adverse events in AERD patients treated by aspirin desensitization (AD), biologics (B) or both (BD).

#### Results:

Of 138 patients in our AERD database, 73 received either AD (26) or B (33) or both BD (14). Treatment groups were separately analyzed & reported. Mean age & BMI were 44 years, 29 respectively; 65% were female; 60% were Caucasian; 30% were previous smokers; 64% had aeroallergen hypersensitivity, and 23 (31.5%) had received prior allergy immunotherapy. All had previous sinus surgery, with 49(54.4%) requiring recurrent sinus surgery. The mean number of recurrent surgeries in AD vs B vs BD was 3.5 vs 3.2 ( $p=0.84$ ) vs 4.17 ( $p=0.27$ )

Reduction in FENO scores, IgE levels and AEC - mean difference(MD): FENO: [AD vs B vs BD =21 vs 22, ( $p=0.48$ ) vs 13, ( $p=0.360$ )]; S. IgE [AD vs B vs BD = 26 vs 10, ( $p=0.67$ ) vs 25, ( $p=0.98$ )]; & AEC - [AD vs B vs BD = 107 vs 21, ( $p=0.27$ ) vs 25, ( $p=0.66$ )]. AD cohort had significantly higher adverse events compared to B; GERD - [AD (50%) vs B (18%),  $p=0.03$ ], hypersensitive eruptions (7, 26%). Of the 40 patients (AD +BD) who underwent aspirin desensitization, 26 (65%) continued to take aspirin, 6 (15%) patients failed desensitization; 7 (17.5%) discontinued it due to adverse events and switched to biologics.

#### Conclusion:

Aspirin desensitization and biologics effectively manage AERD but AD results in higher adverse effects and failure rates while Biologics is better-tolerated in well-selected patients. However, larger studies are required to provide guidelines in choosing one of them over the other.

1:48 PM - 1:55 PM

**Asthma increases long-term revision rates of endoscopic sinus surgery in chronic rhinosinusitis with and without nasal polyposis (R)**

Amarbir Gill, MD  
 Kristine Smith, MD  
 Huong Meeks, PhD  
 Gretchen Oakley, MD, FARS  
 Karen Curtin, PhD  
 Richard R. Orlandi, MD, FARS  
 Jeremiah A. Alt, MD, PhD, FARS  
 University of Utah

**Background:**

Chronic rhinosinusitis with asthma (CRS-A) has a significant impact on patient morbidity and quality of life. Nevertheless, little is known about the natural history of endoscopic sinus surgery (ESS) in this cohort. The objective of this study was to evaluate revision rates of ESS in CRS-A and identify risk factors associated with increased likelihood for revision surgery compared to those with CRS without asthma (CRS-alone).

**Methods:**

The Utah Population Database was queried for patients age > 18 with CRS who underwent at least one ESS between 1996 and 2018. Demographic information and history of ESS were collected and compared between CRS-A and CRS-alone using chi-square tests for categorical variables and t-tests for continuous variables. Risk factors for revision surgery were analyzed using Cox proportional hazard models.

**Results:**

A total of 34,560 patients (7977 CRS-A and 26,583 CRS-alone) were included in the final analysis. Mean follow up was 9.5 years in CRS-A and 8.8 years in CRS-alone ( $p < 0.001$ ). The revision rate among patients with CRS-A (21.8%) was twice that of CRS-alone (11.0%) ( $p < 0.001$ ). Among patients with CRS, a history of allergy ( $p < 0.001$ ), asthma ( $p < 0.001$ ), and nasal polyposis ( $p < 0.001$ ) was independently associated with increased risk of revision ESS. Patients with CRS-A and nasal polyposis were 6 times more likely to require revision surgery than those with CRS-alone ( $p = 0.01$ ).

**Conclusion:**

The rate of revision ESS in CRS-A was twice that of CRS-alone; patients with CRS-A and nasal polyposis were 6 times more likely to require revision than those with CRS-alone.

1:55 PM - 2:02PM

**Central compartment atopic disease: Comparative analysis of surgical outcomes amongst subtypes of chronic rhinosinusitis with nasal polyps (R)**

Andrew Steehler, BS  
 Jackson Vuncannon, MD  
 Sarah Wise, MD, FARS  
 John DelGaudio, MD, FARS  
 Emory University School of Medicine

**Background:**

Central compartment atopic disease (CCAD) is a variant of CRSwNP characterized by polypoid degeneration of the superior nasal septum and middle/superior turbinates. This study compares surgical outcomes in patients with CCAD vs other CRSwNP subtypes.

**Methods:**

A retrospective analysis at a tertiary center from May 2012 – Nov. 2019 was performed. Patients undergoing primary ESS for CCAD, AERD, AFRS, and CRSwNP NOS were included, beginning with date of the earliest CCAD ESS patient and added consecutively until adequate group sizes were achieved. Outcome measures included polyp recurrence, revision ESS, oral steroid, and antibiotic use. Pearson Chi square and univariate ANOVA was performed for comparison across groups.

**Results:**

Data was collected for 132 patients (CCAD=38, AERD=20, AFRS=37, CRSwNP NOS=37) including 74 male and 58 female patients with mean age of 42.9 (range 13-85). CCAD patients demonstrated polyp recurrence less frequently than expected, whereas AFRS patients had polyp recurrence more frequently than expected ( $p = 0.003$ ;  $\phi = 0.32$ ). CCAD patients underwent revision ESS less frequently than expected; AFRS and CRSwNP NOS underwent revision ESS more frequently than expected ( $p = 0.03$ ;  $\phi = 0.26$ ). CRSwNP NOS patients received more total antibiotic courses than those with CCAD ( $p = 0.01$ ;  $\eta^2 = 0.09$ ) and more courses of antibiotics per month than those with AFRS ( $p = 0.03$ ;  $\eta^2 = 0.07$ ). There was no significant difference in follow-up measures across groups (number of visits, total months, or visits per month).

**Conclusion:**

Rates of polyp recurrence and revision ESS were significantly lower in CCAD patients compared to patients with other CRSwNP subtypes, suggesting durable benefit of ESS in CCAD patients.

2:02 PM - 2:07 PM

**Q&A (L)**

2:07 PM - 2:25 PM

**Break**

2:25 PM - 3:10 PM

**Panel: Where do biologics fit in the management algorithm of Aspirin Exacerbated Respiratory Disease? (L)**

Moderator: Amber Luong, MD, PhD, FARS  
 Panelists: John Bosso, MD; Tanya Laidlaw, MD; Justin Turner, MD, FARS; Lauren Roland, MD

**Moderators: Michael Kohanski, MD; Nyall London, MD; Angela Donaldson, MD, FARS**

3:10 PM - 3:17 PM

**Adverse events of oral antibiotic therapy for acute rhinosinusitis in the pediatric population: A systematic review and meta-analysis (R)**

Lucas Axiotakis  
Betsy Szeto  
Joseph Gonzalez  
David Gudis, MD, FARS  
Jonathan B. Overvest, MD, PhD  
Columbia University Vagelos College of Physicians and Surgeons

**Background:**

Pediatric acute rhinosinusitis (ARS) is often treated with oral antibiotics, with limited insight into adverse events (AEs) across drug classes. In this systematic review and meta-analysis, we characterize AE incidence associated with oral antibiotics in this patient population.

**Methods:**

We searched PubMed and Embase for English-language articles published from 1985 to September 2020 reporting AEs of oral antibiotic therapy for ARS patients aged 0-18 years. 633 articles underwent title and abstract screening, identifying 116 articles for full-length and bibliography screening by two independent reviewers.

**Results:**

We included 11 articles, where 9 studies reported individual AEs and 2 studies reported only aggregate rates. Amoxicillin/clavulanate and amoxicillin groups were included in 4 of 9 studies, 5 studies included a cephalosporin or carbacephem group, and 4 studies included a placebo group. Using random-effects meta-analysis, incidence of diarrhea was 13.7% (CI:6.1-23.4, I<sup>2</sup>=73), 8.7% (CI:0.0-28.1%, I<sup>2</sup>=89), 5.3% (CI:1.5-10.9%, I<sup>2</sup>=49), and 7.2% (CI:1.3-16.4%, I<sup>2</sup>=67) for amoxicillin-clavulanate, amoxicillin, cephalosporins/carbacephem, and placebo, respectively. Incidence of abdominal pain was 4.6% (CI:0.8-10.6, I<sup>2</sup>=65), 7.7% (CI:0.0-27.0%, I<sup>2</sup>=90), 0.6% (CI:0.0-2.5%, I<sup>2</sup>=0), and 3.5% (CI:0.0-12.0%, I<sup>2</sup>=73), while incidence of any AE was 19.1% (CI:6.1-36.6%, I<sup>2</sup>=85), 13.7% (CI:0.0-37.8%, I<sup>2</sup>=97), 8.8% (CI:0.6-23.1%, I<sup>2</sup>=83), and 11.3% (CI:5.0-19.5%, I<sup>2</sup>=56) for these respective groups. Incidence of rash was <5.0% (I<sup>2</sup>=0-65) for all groups.

**Conclusion:**

Reporting of AEs associated with oral antibiotic use in pediatric ARS is limited. Clarity on cumulative and class-specific AE incidence will empower prescribing clinicians.

3:17 PM - 3:24 PM

**A novel oxygen-generating biomaterial for CRS therapy (R)**

Do Yeon Cho, MD  
Dong Jin Lim, PhD  
Daniel Skinner, BS  
Shaoyan Zhang, PhD  
Jacob Owen, BS  
Jessica Grayson, MD  
Bradford Woodworth, MD, FARS  
University of Alabama at Birmingham

**Background:**

Hypoxia due to closure at the osteomeatal complex is wide-

ly considered one of the major pathogenic mechanisms leading to inflammation in chronic rhinosinusitis (CRS). Oxygen-generating biomaterials (OGBs) are emerging as an important treatment strategy for damaged tissue from hypoxia. The objective of this study is to develop a novel OGB and characterize oxygen (O<sub>2</sub>) release in-vitro.

**Methods:**

An OGB was fabricated by coating catalase (CA, 0.1mg/mg) mixed with dried beeswax (BW, hydrophobic) on the surface of calcium peroxide (CPO, 30mg/ml). In-vitro releases of both O<sub>2</sub> and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) were spectrophotometrically quantified after placing in distilled water (1ml) (mimicking saline irrigation), and cytotoxicity in human sinonasal epithelial cells (HSNECs) was evaluated using a LDH assay.

**Results:**

Three groups of OGBs [1) CPO only, 2) CPO coated with CA and BW (1:1 ratio, CPO-CA(1)-BW(1)), 3) CPO coated with CA and BW (1:0.5 ratio, CPO-CA(1)-BW(0.5))] were analyzed for accumulated O<sub>2</sub> release over 7 days: highest release (mmol/mg) was observed in CPO-CA(1)-BW(1)=0.11±0.003, followed by CPO-CA(1)-BW(0.5)=0.08±0.01 and CPO=0.05±0.004 (p<0.001). H<sub>2</sub>O<sub>2</sub> production(mM) was significantly higher in CPO (0.82±0.12) compared to CPO-CA(1)-BW(1) (0.13±0.21) (p<0.001) after 24 hours. CPO-CA(1)-BW(1) minimized % cytotoxicity in HSNECs (1.2±0.58) when compared to CPO (4.68±3.01), although there was no significant difference amongst OGBs and control (0.90±0.89, p=0.08) after 24 hours.

**Conclusion:**

A novel OGB (CPO-CA-BW complex) exhibited sustained oxygen release over 7 days without significant cytotoxicity after 24 hours in vitro. Preclinical studies evaluating the efficacy of OGB in CRS are planned.

3:24 PM - 3:31 PM

**Endoscopic sinus surgery for Cystic Fibrosis: Variables influencing sinonasal and pulmonary outcomes (R)**

Keven Ji, MD  
Dennis Frank-Ito, PhD  
Ralph Abi Hachem, MD  
Khalil Issa  
Brad Goldstein, MD  
David Jang, MD, FARS  
Oregon Health and Science University

**Background:**

Prior studies have investigated the effect of endoscopic sinus surgery (ESS) on sinonasal symptoms and pulmonary function in patients with cystic fibrosis (CF). This study aims to assess the impact of demographics, microbiology, revision surgery, and lung transplant (LT) status on sinonasal and pulmonary outcomes after ESS.

**Methods:**

This is a six-year retrospective analysis of adult CF patients who underwent ESS at a single institution. 22-Item Sino-Nasal Outcomes Test (SNOT-22) scores and mean forced expiratory volume (FEV<sub>1</sub>) data at baseline and three to six months after ESS were analyzed using t-test and stepwise regression. Covariates included age, gender, LT, revision surgery, and pseudomonas on sinus culture.

**Results:**

119 ESS were performed on 88 patients. 69% had LT. The overall mean (SD) improvement in total SNOT-22 score was 9.42 (18.15) for the entire cohort ( $p < 0.001$ ). Pseudomonas on culture was associated with less improvement in SNOT-22 ( $p = 0.002$ ,  $R^2 = 0.079$ ). There was no significant change in FEV1 after ESS ( $p = 0.94$ ). Revision surgery ( $p = 0.004$ ), older age ( $p = 0.007$ ), and non-LT status were associated with improvement in FEV1 on stepwise regression ( $p = 0.002$ ,  $R^2 = 0.129$ ). There was no correlation between change in SNOT-22 and FEV1.

#### Conclusion:

Although ESS was overall associated with a clinically and statistically significant improvement in SNOT-22 scores in CF patients, patients with pseudomonas may experience less benefit. For pulmonary function, revision ESS in non-LT patients may be associated with better outcomes. Awareness of such variables may help when deciding which CF patients should undergo ESS.

3:31 PM - 3:38 PM

#### **Topical nasal administration of ciprofloxacin in chronic rhinosinusitis: a prospective study (R)**

David Dias, MD  
Jose Gameiro dos Santos  
João Carvalho de Almeida  
Sandra Sousa e Castro  
Cecília Almeida e Sousa

#### Objectives:

To compare concentrations obtained in nasal mucosa after different topical ciprofloxacin formulations in patients with chronic rhinosinusitis with (CRSwNP) and without (CRSSNP) nasal polyposis.

#### Methods:

Patients submitted to Functional Endoscopic Sinus Surgery (FESS) due to CRS between January 2014 and March 2015 were enrolled in a prospective study. Ciprofloxacin was administered preoperatively and mucosal samples collected intraoperatively in ethmoidal cells, maxillary sinus, inferior and middle turbinates. Patients with CRS secondary to systemic diseases were excluded. 94 patients meeting eligibility criteria were randomly divided into 3 subgroups according to formulation used: spray, gel and drops. Mucosal ciprofloxacin concentrations were compared between the different formulations used and between CRSwNP and CRSSNP patients.

#### Results:

In all formulations tested, inferior turbinate was the location where mucosal concentration was highest, both in in CRSwNP and CRSSNP patients. In this location, gel was more effective at delivering ciprofloxacin to the nasal mucosa, both in CRSwNP (3.309 versus 1.769 in drops and 0.227 in spray;  $p < 0.05$ ) and and CRSSNP (1.385 versus 0.766 in drops and 0.545 in spray;  $p < 0.05$ ). CRSwNP presented lower concentrations in the nasal mucosa than their CRSSNP counterparts after gel administration, except at the inferior turbinate. Ciprofloxacin administration by drops, on the hand, reached higher concentrations in CRSwNP patients in all locations.

#### Conclusions:

Our results suggest gel administration is overall the most effective topical nasal administration method for delivery of ciprofloxacin. However, administration by drops seems more effective in patients with nasal polyposis.

3:38 PM - 3:43 PM

#### **Q&A (L)**

**Moderators: John Craig, MD, FARS; David Jang, MD, FARS; Alissa Kanaan, MD**

3:44 PM - 3:51 PM

#### **Systematic review and voxel-based meta-analysis of gray matter alterations in olfactory dysfunction (R)**

Andraia Li, BS  
Rodney Schlosser, MD, FARS  
Matthew Germroth  
Mark Eckert, Professor  
Medical University of South Carolina

#### Objective:

The purpose of this study was to assess regional differences in gray matter morphology between patients with olfactory dysfunction (OD) and healthy controls (HC).

#### Methods:

We performed a comprehensive search of databases for voxel-based morphometry studies designed to examine gray matter volume (GMV) differences between patients with OD and HC. Ten studies, comprising 4 congenital OD data-sets (87 patients and 81 controls) and 6 acquired OD data-sets (142 patients and 165 controls), were included in Seed-based d Mapping (SDM) meta-analyses to identify significant GMV differences between patients and controls. Follow-up analyses were performed to assess the influence of varied imaging methods on the GMV findings.

#### Results:

Congenital patients exhibited relatively elevated GMV in the right orbitofrontal cortex (OFC), while acquired OD patients exhibited relatively reduced GMV in the right OFC. SDM analysis of the absolute effect sizes across studies demonstrated a small effect of OD on GMV in left cerebellar hemisphere (Crus I) ( $g = 0.34$ ) and a medium effect in right OFC ( $g = 0.50$ ), with this effect most pronounced in the right gyrus rectus (GR) ( $g = -0.64$ ) when comparing only the acquired OD cases to controls. In addition, acquired OD patients exhibited consistently lower GMV in the left Crus I ( $g = -0.58$ ). Differences in imaging methods across studies (e.g., scanner field strength) did not appear to affect the results.

#### Conclusions:

Atypical GMV is consistently observed in olfactory dysfunction, particularly in the right OFC and left Crus I. These brain regions appear to be targets for understanding the pathology of distinctive etiologies of olfactory dysfunction and their consequences.

3:51 PM - 3:58 PM

#### **Association between social determinants of health and olfactory function: A scoping review (R)**

Joel James, BS  
Avraham M. Tsvik  
Sei Y. Chung, MD  
David Gudis, MD, FARS  
Jonathan B. Overvest, MD, PhD  
City University of New York School of Medicine

#### Background:

Social determinants of health include the socioeconomic, demographic and social conditions that impact differences in health status among individuals and groups. The influence of social determinants on olfactory function remains

poorly understood. In this scoping review, we aim to systematically review the available literature to synthesize the association between the social determinants of health and olfactory function.

#### Methods:

Per PRISMA-ScR guidelines, we performed systematic search queries in PubMed, Embase, Ovid and Cochrane databases and categorized articles according to themes that emerged regarding the social determinants of health. The primary outcomes included self-reported and objective measurements of smell.

#### Results:

722 unique references were identified and underwent title and abstract review by two independent reviewers, leaving 70 for full-text review and 42 for data extraction. Six themes emerged in our review, under which we categorized the studies and synthesized respective associations with olfactory function. These include studies exploring socioeconomic status (n=18, 43%), education status (n=23, 55%), occupational exposures (n=9, 21%), racial/ethnic disparities (n=14, 33%), lifestyle/behavioral factors (n=21, 50%), and neurocognitive/neuropsychiatric diseases (n=19, 45%).

#### Conclusions:

We provide a scoping review to provide context on the association between olfactory function and social determinants of health. We highlight the importance of accounting for social determinants of health in observational studies examining olfactory outcomes. Given the increased awareness of olfactory loss, special awareness should be given to understanding olfactory dysfunction in the context of these factors.

3:58 PM -4:05 PM

#### **Intraoperative application of CNN-automated segmentation of anterior skull base structures with a novel 3D navigation system (R)**

Caio Neves, MD  
Emma Tran, BS  
Nikolas Blevins, MD  
Peter Hwang, MD, FARS  
University of Brasilia

#### Background:

Intuitive, patient-specific identification of critical neurovascular structures remains a primary goal of navigation technology in endoscopic anterior skull base surgery. This study presents the automated segmentation of anterior skull base anatomical structures by a convolution neural network (CNN) approach and the incorporation of the predicted models to an enhanced 3D navigation system.

#### Method:

The internal carotid artery (CA), the canalicular optic nerve (ON) and the sella turcica (ST) in 150 clinical CT scans were manually segmented to train a supervised CNN algorithm and to build a segmentation prediction model. Objective assessment of the accuracy of the auto-segmented structures was performed in terms of the Dice score and Hausdorff's error distance. A navigation system was developed to use the artificial intelligence generated models to render a 3D virtual scene which simulates the endoscopic view, suitable for image guidance. Target registration error (TRE) was assessed from the surface registration.

#### Results:

The Dice scores were 0.76±0.12; 0.81±0.10; 0.84±0.08 and

mean Hausdorff's distance in mm were 0.54±0.1; 0.32±0.09 and 0.47±0.12 for the CA, ON and ST respectively on a testing set. Using 3D Slicer platform, our system was successfully implemented in the transsphenoidal approach to the pituitary on 3 cadaveric heads. The mean TRE was 1.8±0.3 mm, and the surgeon was able to identify the neurovascular targets based on the autosegmented rendering.

#### Conclusion:

We present a solution for the auto-segmentation of anterior skull base structures. It can provide valuable anatomic information to promote personalized surgical planning and intraoperative guidance as shown by our proof-of-concept navigation system.

4:05 PM - 4:12 PM

#### **Treatment of epistaxis using the National Inpatient Sample and Centers for Medicare/Medicaid Services national databases: A comparison of endovascular and endoscopic procedures (R)**

Tory McKnight, BS  
Theodore Klug, MD, MPH  
Glen D'Souza, MD  
Blair Barton, MD  
Michael Karsy  
Gurston Nyquist, MD, FARS  
Marc Rosen, MD, FARS  
Elina Toskala, MD, FARS  
Aykut Unsal, MD  
Mindy Rabinowitz, MD, FARS  
Thomas Jefferson University

#### Objective:

Endoscopic artery ligation (EAL) and endovascular embolization (EE) are treatment strategies for severe refractory epistaxis. National cost trends and regional variations in treatment were explored.

#### Methods:

The Nationwide Inpatient Sample (NIS) database (2001-2013) and the Center for Medicare/Medicaid Services (CMS) database (2016-2020) were interrogated for trends in treatment strategy, location and reimbursement for patients undergoing EAL or EE. Data were analyzed by linear regression.

#### Results:

9,102 cases in the NIS (4,283 EAL vs. 4,819 EE) were evaluated. Total mean inflation-adjusted charges to Medicare were significantly higher after EE vs. EAL (\$50,913 vs \$29,869 respectively, p=0.0001) from 2001-2012, during which EE rates also increased from 21% to up to 80% of procedures. This shift was mainly seen in urban, teaching centers taking the majority of cases. The CMS database reflects the same trend toward increased EE (1,035 EAL vs. 4,641 EE from 2012 to 2017) but shows a reduction in mean Medicare EE reimbursements (\$2,816 in 2014 to \$2,353 in 2017) despite relatively unchanged procedural costs. By contrast, both costs and reimbursements for EAL remained stable during this same timeframe.

#### Conclusion:

These results suggest dramatic shifts in the treatment of severe epistaxis towards EE, which almost exclusively occur in urban teaching hospitals. Decreasing Medicare reimbursement rates despite unchanging costs illustrate the financial burden of these changes. Notably, published data from 2014 suggest that EE may offer only a marginal

increase in efficacy compared to ligation (70% vs 68%). These data suggest a significant financial benefit in attempting EE for treatment of severe, refractory epistaxis first.

4:12 PM - 4:17 PM

**Q&A (L)**

**Moderators: Erin O'Brien, MD, FARS; Frederick Yoo, MD; Philip Chen, MD, FARS**

4:18 PM - 4:25 PM

**Clinical features of parosmia associated with SARS-CoV-2 infection (R)**

Katherine Garvey, MPH  
David Lerner, MD  
Annie Arrighi-Allisan, BA  
Andrey Filimonov, MD  
Peter Filip, MD  
Janki Shah, MD  
Benjamin Tweel  
Madeleine Schaberg, MD  
Anthony Del Signore, MD  
Satish Govindaraj, MD, FARS  
Alfred Marc Illoreta, MD  
Icahn School of Medicine at Mount Sinai

**Background:**  
SARS-CoV-2 infection has been linked to new-onset olfactory dysfunction (OD). Parosmia, qualitative OD, associated with SARS-CoV-2 is not well understood.

**Methods:**  
Individuals with OD due to SARS-CoV-2 infection were recruited from otolaryngology practices and a web-based application. Participants completed an OD survey, Modified Questionnaire of Olfactory Disorders-Negative Statements (QOD-NS) and Sinonasal Outcome Test (SNOT-22). Descriptive statistics were used to analyze responses.

**Results:**  
86 participants completed the surveys at a mean of 231.4 days (SD 22.6 days) after symptom onset. 77.9% were female with a mean age of 41.0 years (SD 12.2 years). 76.7% experienced anosmia as their first OD symptom, with only 5 (5.8%) reporting parosmia and 10 (11.6%) reporting both parosmia and hyposmia at OD onset. Parosmia developed within 1 week of OD onset in 17.4%, 1-2 weeks in 8.1%, 2-4 weeks in 9.3%, 1-4 months in 16.3%, 4-6 months in 11.6% and >6 months in 1.2%. 70.9% experienced at least 2 smell distortions, most commonly phantom smells of chemicals (50%), burning (30.2%), rotten meat (29.1%) and cigarette smoke (26.7%). 55.8% reported concurrent ageusia. 64.0% received treatment, including omega-3 fatty acids (38.3%), smell retraining (29.1%), saline irrigations (15.1%), budesonide irrigations (8.1%), fluticasone sprays (7.0%) and oral steroids (7.0%). Mean QOD-NS and SNOT-22 scores were 13.2 (SD 5.2) and 25.2 (SD 13.2), respectively.

**Conclusions:**  
SARS-CoV-2-induced parosmia develops gradually as olfaction recovers, most often within 1 month of OD onset. Smell distortion varies and impacts quality of life, prompting those affected to pursue a variety of treatments of currently unknown efficacy.

4:25 PM - 4:32 PM

**COVID-19 related olfactory dysfunction incidence and natural history among ambulatory patients (R)**

Daniel Bacon, BS  
Princess Onuorah, BS  
Alexander Murr, BS  
David Wohl, MD  
Jonathan Oakes, BS  
Adam Zanation, MD  
Charles Ebert Jr., MD, FARS  
Brian Thorp, MD, FARS  
Brent Senior, MD, FARS  
Adam Kimple, MD, FARS

**Background:**  
Olfactory dysfunction (OD) has been identified as an early indicator of COVID-19 infection. The incidence of OD among hospitalized patients has been reported to be near universal, with 1/3 of patients exhibiting persistent OD 6-8 weeks after diagnosis. However, studies in ambulatory patients been limited by subjective measurements and retrospective study design. We used an objective measure to detect and score OD among outpatients presenting for SARS-CoV-2 testing.

**Methods:**  
74 COVID-19 positive patients and an age- and sex-matched control group who tested negative for SARS-CoV-2 completed the Brief Smell Identification Test (BSIT) and a questionnaire about smell, taste and nasal symptoms an average of 8.9 days after a COVID-19 test. This was repeated at 1 month for all positive patients, and at 3 months for those who exhibited persistent OD at 1 month.

**Results:**  
46.34% of initial BSIT scores in COVID-19 patients demonstrate measurable olfactory dysfunction compared to 3.85% in those who tested negative ( $p < 0.001$ ). On average olfactory scores in COVID-19 positive patients improved by 1 month from 7.85 to 9.89. ( $p = 0.0179$ ), with 10.71% still exhibiting OD (BSIT < 9). There was no correlation between olfactory dysfunction and self-reported nasal congestion at time of initial BSIT ( $r = -0.216$ ; 95% CI, -0.49-0.10;  $p = 0.1807$ )

**Conclusions:**  
OD in ambulatory COVID-19 patients was common and occurred about half as frequently as reported in hospitalized patients. About 90% of patients regained normal olfaction by 1 month. Interestingly, consistent with clinical observations, OD did not correlate with nasal congestion. Individuals with new onset OD should immediately quarantine and be tested for COVID-19.

4:32 PM - 4:39 PM

**Telehealth and the otolaryngology patient: A comparison of patient satisfaction with in-office appointments and virtual visits due to COVID-19 (R)**

Annie Arrighi-Allisan, BA  
Katherine Garvey, MPH  
Janki Shah, MD  
Anni Wong, MD  
Aisosa Omorogbe, Mr.  
Satish Govindaraj, MD, FARS  
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Icahn School of Medicine at Mount Sinai

**Objectives:**  
The COVID-19 pandemic has forced otolaryngologists to

seek new methods of providing patient care in a remote setting. The effect of this paradigm shift on patient satisfaction, however, remains unelucidated. This study compares patient satisfaction with telehealth visits during the COVID-19 pandemic to that with in-office visits during the same period in 2019.

#### Methods:

Press Ganey satisfaction survey comments were analyzed and assigned a valence of positive, neutral, mixed, or negative (+1, 0, 0, and -1, respectively). For patients who commented on more than one aspect of their visit, aggregate scores were calculated by averaging all available values. Mann-Whitney U and Chi-Square Test of Independence were utilized to detect differences between groups.

#### Results:

The cohorts of patients seen in clinic in 2019 (750) and via telehealth in 2020 (158) did not differ by gender composition (49.67% vs. 46.84% female,  $p=0.26$ ), though in-office patients were slightly older than those seen via telehealth (57.16 vs. 55.49 years,  $p=0.47$ ). Patient overall satisfaction with in-office and telehealth visits did not differ significantly (34.62% vs. 39.88% rated as positive or strongly positive,  $p=0.63$ ). A patient's age did not correlate significantly with the likelihood of rating the telehealth component of their visit poorly ( $p=0.45$ ).

#### Conclusions:

Patients seen via telehealth during COVID-19 reported levels of satisfaction similar to those seen in-office the year prior. These telehealth satisfaction levels, however, are contextualized within the expected confines of a pandemic. Further research is required to determine whether satisfaction remains consistent as telemedicine becomes a more ubiquitous component of medical practice.

4:39 PM - 4:46 PM

#### **COVID smell tracker: A novel research-based mobile application to study anosmia and ageusia in subjects with COVID-19 (R)**

Tory McKnight, BS  
Glen D'Souza, MD  
John Pueringer, Mr.  
Matthew Brennan, MD  
Theodore Klug, MD, MPH  
Mindy Rabinowitz, MD, FARS  
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Marc Rosen, MD, FARS  
Aykut Unsal, MD  
Thomas Jefferson University

#### Introduction:

Up to 60% of people infected with SARS-CoV-2 report anosmia or ageusia during their disease course. "COVID Smell Tracker" is a smart phone application (app) developed to elucidate the onset, duration and extent of anosmia and ageusia through questionnaires.

#### Methods:

"COVID Smell Tracker" is publicly available on smart phone devices ([www.covidsmelltracker.org](http://www.covidsmelltracker.org)). The app instructs those with "loss of taste or smell" to complete surveys around demographics, medical history, COVID status and symptomatology. Deidentified responses were collated and analyzed using descriptive statistics (MS Excel).

#### Results:

Of the 202 persons who completed surveys, 110 (54.5%) were male, with 131 (64.9%) white, 22 (10.9%) Indian, 20 (9.9%) Latino, 14 (6.9%) Asian, 9 (4.5%) black, and 6 (3%) Native American/Hawaiian. A minority had confirmed positive ( $n=37$ , 18.3%) or negative ( $n=6$ , 3.0%) COVID status, but most ( $N=165$ , 81.7%) reported no test experience. Thirty-six % ( $n=73$ ) had anosmia with an average of 5.2 concomitant symptoms; headache ( $n=42$ , 57.5%), congestion ( $n=41$ , 56.2%) and fatigue ( $n=40$ , 54.8%) were most common. Most ( $n=46$ , 63%) with resolved anosmia reported sudden onset of smell loss (mean=3d after first COVID symptom) and an average duration of 22d. Those with resolved anosmia often reported concomitant ageusia (sweet:  $n=33$ , 45.2%, sour:  $n=31$ , 52.5%, salty:  $n=29$ , 39.7%, bitter:  $n=32$ , 43.8%).

#### Conclusion:

These results correlate with other reports of COVID-related smell/taste loss, despite no definitive COVID diagnosis in most subjects. Mobile app use offers a novel method for safe, remote and granular insight into patient demography, symptoms, disease course and prognosis of highly infectious diseases such as COVID-19.

4:46 PM - 4:53 PM

#### **Middle East burn pit exposure is associated with decreased sinonasal quality of life in returning deployers (R)** Christopher Hill, MD

Charles Meyer  
Danielle Anderson  
James Mclean  
Yajing Hao  
Feng-Chang Lin  
Adam Kimple, MD, FARS  
Gregory Capra, MD, FARS

#### Introduction:

Respiratory diseases are highly prevalent among service members returning from Iraq and Afghanistan. Specifically, burn pit exposure is associated with a higher prevalence of self-reported emphysema, chronic bronchitis, and COPD. Considering the unified airway concept, we sought to determine the relationship between burn pit exposure and patient reported sinonasal outcome measures (SNOT-22 and NOSE).

#### Methods:

A retrospective chart review was performed of all adult patients presenting to a rhinology clinic between September 1, 2019 and March 31, 2020. Demographics, past medical history, deployment history, self-reported burn pit exposure, SNOT-22 and NOSE scores were abstracted from the medical record and statistical analysis was conducted.

#### Results:

186 patients were included, of which 70.2% were male and the average age was 36. Fifty-four patients (29%) reported burn pit exposure, while 72 (39%) had deployed with no burn pit exposure and 60 (32%) had never deployed. Patients with burn pit exposure were found to have significantly higher SNOT-22 scores (49.2) than either the deployers without burn pit exposure (31.5,  $p<0.001$ ) or non-deployers (31.2,  $p < 0.001$ ). Patients with burn pit exposure also had higher NOSE scores (63.6) than deployers without burn pit exposure (45.7,  $p=0.03$ ). These differences remained significant when adjusted for age, gender and duty status.

**Conclusion:**

This is the first report demonstrating an association between Middle East burn pit exposure and decreased sinonasal quality of life in returning combat veterans. In our study, reported burn pit exposure specifically and not just Middle East deployment was associated with decreased sinonasal QOL years after deployment.

4:53 PM - 5:00 PM

**Q&A (L)**

# POSTERS

Poster #001

## **3D printing as a planning tool to optimize post-surgical sinonasal sinus irrigation**

Kanghyun Kim, BS  
Bradley Otto, MD  
Alexander Farag, MD, FARS  
Kai Zhao, PhD  
The Ohio State University

### Background:

Topical sinus irrigation play a critical role in the management of sinonasal disease. Yet, the penetration of irrigant to targeted sinuses may be highly variable and difficult to predict. We investigate the use of 3D printing as a planning tool to optimize outcomes.

### Method:

Eight post-operative models were 3D printed with a FormLabs Form3 printer based on individual CT scans. Irrigations were performed and video recorded with a squeeze bottle attached via silicon water-tight seal, at four head positions: 45° to-the-side, 90° to-the-side, 90° forward, and 45° to-the-side and 45° forward. Conventional irrigation involves a head-side-tilt with fluid entering the upper and exiting the lower nostril along with gravity. Here, we investigate the permutation of fluid entering through the lower and exiting the upper nostril (Backfill Technique).

### Results:

Significant differences were observed between targeted sinuses at different head positions. Backfill demonstrated faster (~2-5s) and increased filling volume (~50-100%) of the maxillary sinus for all head positions in 6 of 8 patients, along with some improved filling of ethmoid, sphenoid, and frontal sinuses. Interestingly, the more natural head position, 45° to-the-side and 45° forward, provided the most dichotomy of outcomes with almost no maxillary penetration for conventional irrigation vs. 100% for backfill technique among 4 of 8 patients.

### Conclusion:

Variation in technique and position impacted irrigation outcome significantly. Backfill irrigation, which pushes irrigant against gravity to pool around the ostium, seems to provide overall better outcomes. This demonstrates the need for a rapid planning tool to guide patient-specific irrigation strategy.

Poster #002

## **A multidisciplinary approach to sino-orbital osteoma**

James Connelly, BA  
Yash Vaishnav  
Rebecca Compton  
Jamie Schaefer  
Jan Groblewski  
The Warren Alpert Medical School of Brown University

### Introduction:

Osteomas represent the most common benign neoplasm of the paranasal sinuses, but rarely involve the orbit. Complete surgical resection is challenging and associated with potentially devastating morbidity.

### Case Description:

A 16-year-old male presented with 2 months of progressive right proptosis. Past medical history was significant for recurrent epistaxis in childhood. Vision was 20/20, no afferent pupillary defect was noted and extraocular motility was full. There was 2.5mm of right proptosis, resistance to globe retropulsion and edema of the right optic disc. CT scan showed a lobulated bony lesion measuring 2.4x2x1.4cm involving the posteromedial orbital floor, maxillary antrum, and posterior ethmoid air cells, impinging upon the optic canal. Given the growth rate, size, and proximity to the optic nerve, complete resection was recommended. The tumor was approached endoscopically following maxillary antrostomy with ethmoidectomy and directly via an extended transconjunctival approach with lateral canthotomy and inferior cantholysis and transcaruncular orbitotomy. The lesion was downfractured into the nose, where it was debulked before being prolapsed back into the orbit and extracted through the orbitotomy incision. The orbital floor was reconstructed using a high-density polyethylene sheet with titanium mesh. Pathology showed a mixed benign osseous lesion with prominent osteoblastic rimming, consistent with osteoma.

### Discussion:

There is no consensus on the optimal surgical approach for sinoorbital osteoma due to the rarity and variability of the condition. We advocate for an individualized, multidisciplinary approach, taking into consideration patient symptoms as well as the size and position of the tumor.

Poster #003

**Adverse events associated with corticosteroid-eluting sinus stents**

Vishal Narwani, MD  
David Kasle  
Sina Torabi, Medical Student  
Rahul Patel  
Michael Lerner  
R. Peter Manes, MD FARS  
Yale University

**Background:**

The postoperative management of chronic rhinosinusitis (CRS) has evolved in the last decade with the introduction of corticosteroid-eluting sinus stents. These stents provide localized delivery of corticosteroids, and maintain the patency of the neosinus after endoscopic sinus surgery. The objective of this study was to analyze complications associated with corticosteroid-eluting sinus stents utilizing the Manufacturer and User Facility Device Experience (MAUDE) database.

**Methods:**

The Food and Drug Administration's (FDA) MAUDE database was queried for all reports on adverse events related to Propel and Sinuva corticosteroid-eluting stents, from January 1, 2010 to October 31, 2020.

**Results:**

A total of 27 adverse events related to Propel corticosteroid-eluting stents were identified, and no events were identified for Sinuva corticosteroid-eluting stents. Of these, 23 (85%) were associated with Propel stents, and the remainder were associated with Propel Mini and Propel Contour stents. The most common adverse events were related to post-operative infection, accounting for 37% of the complications, followed by migration of the stent, representing 22% of all complications. Five patients (19%) in our cohort required re-intervention in the operating room, directly related to an adverse event caused by the corticosteroid-eluting stent.

**Conclusion**

Corticosteroid eluting-stents have improved the post-operative management of patients with CRS. Our study shows that these devices are well tolerated. The most common adverse events in our study were associated with post-operative infection, followed by migration of the stent.

Poster #004

**Analyzing the practice patterns of otolaryngologists in the United States during the COVID-19 pandemic**

Laura Van De Laar, MD  
Karthik Shastri  
Nathan Cass  
Naweed Chowdhury, MD  
Vanderbilt University Medical Center

**Background:**

The novel coronavirus (COVID-19) pandemic has placed a significant burden on the United States healthcare system. Personal protective equipment (PPE) for healthcare workers and viral testing remain important resources in high demand, but information about PPE utilization in otolaryngology and test positivity among physicians remains low.

**Methods:**

A 32-item survey regarding PPE practices, preoperative COVID-19 testing, and COVID-19 positivity was electronically disseminated to staff otolaryngologists and otolaryngology residents at multiple academic institutions from 9/29/2020 to 11/28/2020.

**Results:**

Respondents included 54 staff otolaryngologists and residents from 4 academic institutions in Colorado, New York, Texas and Tennessee. 94.4% of respondents indicated scheduled surgery patients "always" have preoperative COVID-19 testing, and 87.0% indicated non-urgent, non-emergent add-on surgery cases "always" receive preoperative COVID-19 testing. Only 3 respondents (5.6%) reported testing positive for COVID-19. No otolaryngologists responding to this survey required hospitalization for COVID-19. PPE practices varied between institutions. When asked about the use of N-95 masks in the operating room during AGPs in a patient testing negative for COVID-19 preoperatively, responses ranged from one institution having 62.5% reporting "never" wearing an N-95 mask, to 68.8% reporting "always" wearing an N-95 mask at another institution.

**Conclusions:**

Preoperative COVID-19 testing appears to be standard in all institutions surveyed. The PPE practices during the COVID-19 pandemic differ considerably among institutions. The number of otolaryngologists reporting personally testing positive for COVID-19 was low in this study.

Poster #005

**Atypical cause of facial nerve palsy and otorrhoea:  
Sinonasal squamous cell carcinoma with direct spread  
to both ears**

Jason Lim, MBBS (Hons)

Tim McLean, Dr.

Jean-Marc Gerard, Mr.

The Royal Victorian Eye and Ear Hospital

**Aim:**

We describe a patient who presented with unilateral facial nerve palsy and otorrhoea as a result of invasive sinonasal squamous cell carcinoma (SCC). To our knowledge, this is the first case report in the literature of a primary sinonasal SCC involving bilateral middle ears.

**Methodology:**

Patient consent was obtained for use of de-identified medical information. Information including history, examination findings, investigation results and management were collated.

**Results:**

A 42-year old lady was referred to our institution following an acute onset of left facial nerve palsy and otorrhoea. She had bilateral otalgia and headaches for 5 months, along with anosmia, nasal obstruction and discharge. Examination showed an abnormal mass in the left nasal cavity extending into the nasopharynx, with a polypoid mass in the left external auditory canal and a right middle ear effusion. There was a left complete facial nerve palsy and reduced sensation across the distribution of her left trigeminal nerve. Biopsy of her nose and ear lesions confirmed a poorly differentiated sinonasal SCC. Further scans and comparison with historical imaging showed a mass arising from the left posterior ethmoid sinuses, which had spread to the nasopharynx and progressed along the Eustachian tubes to involve both middle ear clefts and mastoids. Following a multidisciplinary team meeting, she was recommended for induction chemotherapy to guide definitive treatment.

**Conclusion:**

Sinonasal SCC can be difficult to diagnose as it may remain asymptomatic until advanced. It can present with a range of unusual symptoms including in this case, facial nerve palsy. Clinicians should maintain a high index of suspicion for atypical facial nerve palsy presentations.

Poster #006

**Can the 5-item modified frailty index predict outcomes  
following resection of intradural skull base lesions**

Khodayar Goshtasbi, MS

Jack Birkenbeuel, Medical Student

Brandon Lehrich

Arash Abiri

Frank Hsu

Edward Kuan, MD, FARS

University of California Irvine School of Medicine

**Objectives:**

To evaluate the impact of preoperative frailty on short-term outcomes following intradural resection of skull base lesions.

**Methods:**

The 2005-2017 ACS-NSQIP database was queried for 30-day post-operative outcomes of patients undergoing intradural resection of the skull base, extracted by CPT codes 61601, 61606, 61608, and 61616. Five-item modified frailty index (mFI) was calculated based on the history of diabetes, COPD, CHF, chronic hypertension, and functional status.

**Results:**

A total of 701 patients (58.8% female, 72.0% white) were included with a mean age of  $51.8 \pm 14.7$  years. Compared to patients with mFI=0 (n=403), patients with mFI  $\geq 1$  (n=298) had longer length of stay (LOS) ( $5.9 \pm 6.8$  vs.  $7.7 \pm 9.1$ ,  $p=0.004$ ) and higher rates of reoperation (8.7% vs. 13.4%,  $p=0.045$ ), medical complications (9.2% vs. 20.5%,  $p<0.001$ ), surgical complications (8.4% vs. 13.8%,  $p=0.024$ ), and discharge to non-home facility (DNHF) (13.3% vs. 24.8%,  $p<0.001$ ). Even after adjusting for age and ASA score as confounders, patients with mFI  $\geq 1$  still had significantly higher likelihood of reoperation (odds ratio [OR]=1.8,  $p=0.028$ ), medical complications (OR=2.2,  $p=0.001$ ), and LOS  $\geq 10$  days (OR=1.8,  $p=0.009$ ). Furthermore, compared to patients with mFI=0-1 (n=564) and after adjusting for age and ASA score as confounders, patients with mFI=2-3 (n=61) were more likely to experience reoperation (OR=2.0,  $p=0.041$ ), medical complications (OR=2.40,  $p=0.003$ ), and LOS  $\geq 10$  days (OR=2.8,  $p<0.001$ ).

**Conclusion:**

The 5-point mFI can be an independent predictor of short-term surgical outcomes following intradural resection of skull base lesions, warranting further investigations into its clinical utility.

Poster #007

**Case report: Sinonasal tumour - a diagnostic conundrum**

Haran Devakumar, MBBS

**Background:**

Myoepithelioma is a rare benign neoplasm, most commonly derived from salivary glands but there are limited cases of extra salivary gland involvement too. There is little knowledge on typical investigative findings and instead, diagnosis relies on immunohistochemistry analysis. To the best of our knowledge, we report the thirteenth case of sinonasal myoepithelioma in the English literature.

**Case:**

We present a 25 year old gentleman who complained of chronic nasal obstruction. A sinonasal mass was noted on examination that appeared benign on imaging. Biopsy revealed a grade 2 chondrosarcoma that was endoscopically resected; however excisional margins were positive. On MDT histopathological review, the lesion was more in keeping with chondromyxoid fibroma but immunohistochemistry analysis confirmed a myoepithelioma lesion. In light of this revised diagnosis a second opinion was for follow up with active monitoring.

**Conclusion:**

Sinonasal tumours require a thorough history, examination and investigation before a treatment plan can be formulated. If there is diagnostic uncertainty, it is important to keep a wide differential list and seek a second specialist opinion where possible.

Poster #008

**Combined exhalational delivery system with fluticasone and budesonide nasal irrigations in patients with chronic rhinosinusitis with nasal polyposis: A preliminary report**

Rosalie Machado

Peter Filip, MD

Anthony Del Signore, MD

Mount Sinai Downtown

**Background:**

Chronic rhinosinusitis with nasal polyps (CRSwNP) is a highly inflammatory state typically requiring intermittent courses of steroids for control. Exhalational Delivery System with Fluticasone (EDS-FLU) and Budesonide suspension in nasal irrigations each have been shown to help mitigate the burden of nasal polyps. To date, there is no data on concomitant use in patients with chronic rhinosinusitis with nasal polyposis otherwise requiring rescue oral steroid treatment or revision endoscopic sinus surgery.

**Methods:**

The combined use of EDS-FLU and budesonide nasal irrigations were retrospectively reviewed in 92 patients with a history of CRSwNP. Sino-Nasal Outcome Test-22 (SNOT-22), nasal endoscopy polyp grade, need for rescue oral steroids and revision endoscopic sinus surgery were collected. Safety and adverse event data was collected.

**Results:**

A total of 92 patients with CRSwNP were reviewed from June 2018-June 2020. Patient demographics reviewed. An improvement in both SNOT-22 and nasal endoscopy scores were noted in the treatment cohort. There was a noted delay in the need of rescue oral steroids and revision sinus surgery. There were no reported increases in intraocular pressure, glaucoma, or suppression of the immune system. No oral thrush, epistaxis, or nasal perforation was reported. No patients discontinued treatment due to complications.

**Conclusions:**

The combined use of EDS-FLU and Budesonide nasal irrigations appears to be safe and tolerable. Further prospective studies evaluating long term side effect profile and their combined role in recalcitrant CRSwNP requiring multiple revision ESS are merited.

Poster #009

**Conditional and overall disease-specific survival in patients with sinus cancer: Improved outcomes in the endoscopic era**

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 Alexandria Irace  
 Rodney Schlosser, MD, FARS  
 Jonathan B. Overdevest, MD, PhD  
 Nicholas Rowan, MD  
 David Gudis, MD, FARS  
 Columbia University Irving Medical Center

**Background:**

Treatment of sinonasal malignancies with endoscopic techniques has become increasingly common since the early 2000s. We sought to characterize the impact of endoscopic surgical techniques on both disease-specific survival (DSS) and changes in life expectancy based on current survival since diagnosis (conditional survival; CDSS) for sinonasal malignancies.

**Methods:**

Patients diagnosed with sinus cancer between 1973-2015 were extracted from the Surveillance, Epidemiology, End Results (SEER) registry. Kaplan-Meier analysis for DSS was stratified by year of diagnosis before and after 2000. Cox-proportional hazards regression models of DSS controlling for stage, age, and year of diagnosis were generated. CDSS was calculated using cox-regression models stratified by stage, and controlling for age and year of diagnosis.

**Results:**

We analyzed 5,253 patients, with 72% diagnosed in 2000 or after. Patients diagnosed after 2000 exhibited independently improved DSS (HR: 0.90, 0.83-0.99,  $p=0.03$ ) after controlling for age and stage. Year of diagnosis exhibited the greatest effect on DSS in localized (HR: 0.68, 0.47-0.99,  $p=0.046$ ) malignancies compared to regional (HR: 0.91, 0.82-1.02,  $p=0.09$ ) and distant (HR: 0.94, 0.77-1.15,  $p=0.50$ ) malignancies when stratified by stage. CDSS improved for all stages of sinonasal cancer with increasing survivorship. Descriptively, the effect of year of diagnosis on CDSS diminished with increasing survivorship for localized cancer, but was consistent and minimal for other stages.

**Conclusion:**

Year of diagnosis independently influences both CDSS and DSS. Better outcomes may be due to improvement in treatment and/or surgical techniques.

Poster #010

**Correlation between the ENT domain of Birmingham Vasculitis Activity Score (BVAS) and the Rhinosinusitis Disability Index (RSDI)**

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**Background:**

Head and neck manifestations of granulomatosis with polyangiitis (GPA) are among the earliest and most prevalent symptoms, occurring in 71.9% of patients, and most frequently with sinonasal involvement (58.4%). The ear, nose and throat, (ENT) domain of the Birmingham Vasculitis Activity Score (BVAS) reflects physical manifestations of vasculitis while the Rhinosinusitis Disability Index (RSDI) captures sinonasal quality of life. The correlation between physical scores (BVAS) and quality of life scores (RSDI) has not been studied.

**Methods:**

Retrospective analysis of patients with GPA who had both an RSDI and ENT BVAS documented within a 1 month period was performed. The primary outcome was the correlation between RSDI score and overall ENT BVAS score. Secondary analysis included the correlation between RSDI and sinonasal-specific BVAS question scores.

**Results:**

100 patients were identified with both an RSDI and ENT BVAS within a 1 month period. There was a weak positive correlation between RSDI and ENT BVAS scores, ( $r=0.36$ ,  $p<0.001$ ). Sinonasal-specific ENT BVAS and RSDI scores, there was also a weak positive correlation ( $r=0.38$ , 95%  $p<0.001$ )

**Conclusions:**

Despite significant sinonasal morbidity with respect to GPA in both physical manifestations and quality of life, there is minimal correlation between ENT BVAS and RSDI scores. This may be attributable to the composite nature of ENT BVAS for which 60% of subcategories assess non-sinonasal head and neck manifestations of GPA. However, the correlation between sinonasal-specific BVAS questions and RSDI is also minimal. Physical scores like ENT BVAS should better reflect the high prevalence and severity of sinonasal disease in GPA.

Poster #011

**Cytotoxic effects of permethrin on cultured human sinonasal epithelial cells**

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**Background:**

Permethrin (PER) is an insecticide used in over 1400 registered products to control pests in agricultural, industry, and residential settings. PER may be effective by contact, ingestion, or inhalation through a mechanism of action involving interference with sodium channels, culminating in neurotoxicity, paralysis, and death. Recent studies have shown that PER may cause toxicities in humans.

**Methods:**

A pilot study was conducted to examine PER's inhaled effects on human sinonasal tissue. Sphenoid sinus mucosa was collected from 5 adults undergoing transsphenoidal pituitary surgery without a history of chronic rhinosinusitis. Mucosa was processed for in vitro cell culture. Sinonasal epithelial cells were grown in a 96-well plate (1,500 cells/well) for 10-15 days and then cultured for 6 days in various concentrations of PER. Following 6 days of PER exposure (0uM-156uM concentrations), tetrazolium dye (MTT) colorimetric assays were performed to assess cell viability. To further assess PER's cytotoxicity, the IncuCyte Live cell analysis system (Essen BioScience, Ann Arbor, Michigan) was used to monitor real-time changes in cell density every 2 hours over 6 days of PER exposure (0uM-5mM concentrations).

**Results:**

Using the MTT assays, a statistically significant reduction in cell viability ( $p=0.004$ ) was observed after a 6-day exposure to 156uM of PER, compared to controls (0uM). Using the IncuCyte Live system, cell density was significantly reduced in a dose-dependent manner after exposure to PER concentrations from 78uM to 5mM ( $p<0.05$ ), compared to controls (0uM).

**Conclusions:**

PER may have deleterious effects on human sinonasal epithelial cells in a dose-dependent manner. Lower doses of PER may not cause cytotoxicity.

Poster #012

**Development of a multi-media educational module of sinonasal anatomy: Face and content validity**

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**Background:**

Endoscopic video allows medical students to observe anatomy in a high-definition viewpoint identical to the teaching surgeon. However, many educational tools for anatomy education have remained constant since the early 1900s. There is critical need to modernize methods of teaching sinonasal anatomy to medical students. Although few become sinus surgeons, students will benefit from improved anatomic knowledge. Our long-term goal is to design self-directed curriculum modules to teach sinonasal anatomy with emphasis on spatial relationships, clinical correlation, and critical anatomical landmarks.

**Methods:**

We developed 2 narrated sinus anatomy teaching modules. The "CT module" is centered on radiologic imaging while the "multi-media module" incorporates endoscopic surgical video. Both versions utilize the same narration and are of identical duration, allowing comparison of educational outcomes specific to addition of endoscopic video. Surveys were sent to rhinologists with demonstrated interest in medical education. Participants were asked to watch the modules and answer questions regarding face and content validity.

**Results:**

Seven rhinologists responded. The multimedia module averaged 4.4 on Likert scale (5 = highest positive response) for questions regarding face validity and 4.3 of 5 regarding content validity. The CT module averaged 4.4 of 5 on questions regarding face validity and 4.5 on questions of content validity.

**Conclusions:**

The responses support high degree of face and content validity for the modules for teaching sinonasal anatomy to medical students. Future studies will compare efficacy and efficiency of the modules using a sinonasal anatomy assessment in randomized medical student samples.

Poster #013

**Diagnosis and localization of cerebrospinal fluid rhinorrhea: A systematic review**

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**Background:**

Cerebrospinal fluid (CSF) rhinorrhea occurs due to abnormal communications between the subarachnoid space and sinonasal cavity. Accurate diagnosis and localization of leaks pre-operatively is vital and many investigations are available. However, this remains suboptimal due to a lack of consensus and accurate understanding of test characteristics. This systematic review aims to assess the diagnostic accuracy of various chemical tests and imaging modalities for diagnosing and localizing CSF rhinorrhea.

**Methods:**

A systematic review of the MEDLINE and EMBASE databases was conducted according to PRISMA guidelines.

**Results:**

Our search identified 4039 articles—53 chart reviews and 24 case series describing 1622 patients were ultimately included. The included studies were heterogenous and often had a wide range of sensitivities and specificities. Many specificities were also in calculable due to a lack of true negative and false positive results, which precluded meta-analysis. The chart reviews for HRCT, MRC, CTC, RNC, and CEMRC had sensitivities and specificities of 0.93 (0.65-1.00) and 0.50 (0.00-1.00), 0.94 (0.81-1.00) and 0.77 (0.17-0.99), 0.95 (0.73-1.00) and 1.00 (0.75-1.00), 0.90 (0.81-1.00) and 0.50 (0.00-1.00), and 0.99 (0.96-1.00) and 1.00 (1.00-1.00), respectively. Case series were also reviewed separately.

**Conclusion:**

MRC is more accurate than HRCT at diagnosing and localizing CSF rhinorrhea. CTC, CEMRC, and RNC have good diagnostic characteristics but are invasive. Beta-2 transferrin is limited by its lack of localization. ITF shows promising data but has not been widely adopted for purely diagnostic use. Office endoscopy has limited data but does not appear to sufficiently diagnose CSF rhinorrhea independently.

Poster #014

**Diffuse nasal papillomatosis of multiple histologic subtypes**

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Schneiderian papillomas are benign sinonasal lesions that are discrete, unifocal, and are divided into exophytic, inverted, and oncocytic subtypes. Rare instances of diffuse nasal papillomatosis have been described in the literature but are restricted to exophytic histology with positive staining for HPV-6 and 11. We present a series of three patients with diffuse bilateral nasal papillomatosis, in which 2/3 cases represent a potentially novel clinical entity consisting of florid HPV-negative multifocal sinonasal papillomatosis of mixed exophytic and inverted subtype.

A retrospective study was conducted that included all patients with florid sinonasal papillomatosis treated at a single institution from January 2019 to November 2020. Pertinent data was collected as available in the electronic health record (EHR).

Three patients met inclusion criteria and were included in this study. All were male, 66% of which were white (33% black), and the average age at diagnosis was 56 years ( $\pm$  12.5). In 2/3 patients, multiple non-contiguous regions of both exophytic and inverted papilloma were noted; a broad HPV panel was negative. A third patient presented with diffuse papilloma of exophytic subtype only; HPV testing for this specimen was not performed. All cases were managed with gross total surgical resection. All patients experienced recurrence at 11 months on average ( $\pm$  4.6).

Diffuse nasal papillomatosis is a rare clinical entity that is typically associated with exophytic histology and low-risk HPV infection. We present an additional case of diffuse exophytic disease, as well as two potentially novel cases of HPV-negative, multifocal, non-contiguous Schneiderian papilloma of mixed exophytic and inverted histology.

Poster #015

**Does eustachian tube dilation help patients with type A tympanograms and elevated ETDQ-7 scores?**

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**Background:**

Obstructive eustachian tube dysfunction (OETD) affects about 4.6% of US adults. The 7-item Eustachian Tube Dysfunction Questionnaire (ETDQ-7), is a validated measure showing excellent discrimination for patients with OETD. In the last few years, we have used the ETDQ-7 questionnaire to assess patients referred for chronic OETD. Several patients have been identified with signs and symptoms of OETD, including elevated scores on the ETDQ-7, but type A tympanograms. Eustachian tube balloon dilation (ETBD) was offered as a last attempt to help these patients. This retrospective study looks at outcomes of ETBD for this subset of patients.

**Methods:**

43 patients with type A tympanograms and ETDQ-7 scores >14.5 underwent eustachian tube balloon dilation (ETBD) between 1/1/2017 and 9/30/2020 to treat obstructive eustachian tube dysfunction (OETD). At least 6 weeks after the procedure, the ETDQ-7 was re-administered, and the scores compared.

**Results:**

Preop ETDQ-7 scores ranged from 17-46, average score of 32.2. After balloon dilation, 11 patients (25.6%) had normalization of the ETDQ-7 (score <14.5). Sixteen patients (37.2%) had >50% reduction in ETDQ-7 score, while 28 patients (63.6%) had >30% reduction in their ETDQ-7 scores after balloon dilation. 13 patients had mild (<30%) improvement in symptoms. In all, 41/43 patients (95.3%) saw some improvement in symptoms after ETBD. Only 2 patients (4.7%) did not improve. There were no complications of surgery, and no patients had worsened symptoms.

**Conclusion:**

Preliminary data suggests that patients with type A tympanograms and elevated ETDQ-7 scores may benefit from eustachian tube dilation as a treatment for obstructive eustachian tube dysfunction.

Poster #016

**Embolization following SPA ligation: Outcomes and risk factors for recurrent bleeding**

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**Background:**

Sphenopalatine artery (SPA) ligation poses a historically successful option for refractory epistaxis. There is little published data analyzing the risk factors believed to be responsible for recurrent bleeding in those patients who fail SPA ligation or fail subsequent embolization.

**Objectives:**

To assess risk factors among those patients who failed SPA ligation followed by embolization for management of refractory epistaxis.

**Study Design:**

Retrospective chart review at a tertiary care facility in a municipal city.

**Subjects and Methods:**

Baseline demographic data, previous medical management, comorbidities, risk factors, anticoagulation status, and angiography/embolization procedure details were collected between June 2015 – August 2020 on patients undergoing embolization following a failed SPA ligation for refractory epistaxis.

**Results:**

195 patients underwent SPA ligation. Of these, 29 experienced recurrence of bleeding within 30 days (success rate of 85%). Of these 29 patients, 25 underwent an additional embolization procedure after the failed SPA ligation. 13 were embolized with both particles and Onyx, 8 with particles alone, and 4 with Onyx alone. Using both particles and onyx resulted in lower rebleed rates (1 out of 3 patients) as compared to particles alone (1 in 2 patients) amongst patients who needed multiple embolization procedures to control epistaxis (p=0.003).

**Conclusions:**

Previous medical management, comorbidities, and anticoagulation status were not statistically significant predictors of recurrent bleeding in patients undergoing embolization following a failed SPA ligation. There was a lower chance of recurrent bleed following usage of both particles and onyx when compared with onyx alone.

Poster #017

**Evaluating correlation between different nasal septum deviation classifications systems and patients complaints**

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**Objectives:**

Literature review of existing nasal septum deviation classification systems. Assess if different classification systems correlate with nasal or aesthetical complaints in patients undergoing septorhinoplasty.

**Methods:**

Systematic review of the literature found within PubMed/MEDLINE using the used the following MeSH terms: "Nose Deformities, Acquired" or "Nose" in combination with search terms "classification," "classification system," "grading," and "grading system." was performed and the most relevant nasal septal deviation classifications were selected. Adult Caucasian patients undergoing septorhinoplasty were included in this study. Patients' responses to the Utrecht and NOSE questionnaires and classification of nasal septal deviation according to the classifications proposed by Vidigal, Salihoglu, Mladina, Cerkes and Gu were collected by an ENT surgeon preoperatively. Utrecht and NOSE questionnaire scores were compared between different patients groups across the different classification systems. The effect of confounding variables, such as gender, presence or absence of allergic rhinitis, previous nasal trauma or nasal valve collapse was evaluated.

**Results:**

The study population included 58 patients (22 males), mean aged 31.2 ( $\pm 13.5$ ) years old. NOSE and Utrecht presented a mean 62.1 ( $\pm 24.1$ ) and 15.8 ( $\pm 4.4$ ) scores respectively and significantly correlated between each other ( $p=0.003$ ,  $r=0.459$ ). When confounding variables were taken into account, none of the classification systems used correlated with NOSE or Utrecht questionnaire score values.

**Conclusions:**

Classifications of nasal septal deviations may be important for preoperative planning and to facilitate communication of results between surgeons however

Poster #018

**Ganglioneurofibroma of the pterygopalatine fossa: Case report and review of the literature**

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**Introduction:**

This is the first reported case of a ganglioneurofibroma originating in the pterygopalatine fossa.

**Case Description:**

A 59 year old woman with a past medical history of hypertension, rheumatoid arthritis on Cimzia and diverticulosis was referred for evaluation of left facial numbness and discomfort in the CN V2 distribution. She underwent maxillofacial computed tomography (CT) demonstrating a pterygopalatine fossa mass extending into the sphenoid sinus. Follow-up magnetic resonance imaging (MRI) was consistent with a suspicious malignant pterygopalatine fossa tumor with an empty sella syndrome. The patient underwent left sided endoscopic pterygopalatine fossa surgery for tumor resection. Final pathology revealed S100-positive fibro-neural proliferation consistent with ganglioneurofibroma.

**Discussion:**

This is the first report of a ganglioneurofibroma in the pterygopalatine fossa. Ganglioneuromas are rare peripheral nerve tumors primarily comprised of ganglion cells, nerve fibers, and Schwann cells. They are generally found in the mediastinum or retroperitoneum, with one previous report of a ganglioneuroma arising in the sphenoid wing. These masses are considered benign and originate from neural crest cells. Several theories have been suggested including origination from precursor cells during embryogenesis, hamartomatous malformations, and differentiation of neuroblastomas. Management consists of gross total resection with regular clinical follow up given rare reports of malignant transformation.

Poster #019

**Giant cell lesions of the sinuses and skull base: Case series and review of literature**

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Giant cell lesions (GCL) are benign bone lesions that rarely occur in the sinuses. They are highly vascular and locally destructive with a high risk of recurrence if surgical excision is incomplete. In our case series, we aim to highlight surgical management of extensive sinonasal GCL with skull base involvement in four patients. The average age was 14.5 years of age, ranging from 11 to 19 years. All patients presented with recurrent disease following endoscopic endonasal surgery. Three patients' GCL involved the clivus; two of these lesions extended from the clivus to the internal carotid arteries whilst one extended from the clivus to the optic chiasm. The fourth patient's GCL involved the superior nasal turbinate and sphenoid sinus. All patients underwent an endoscopic endonasal approach with gross total resection. Intraoperative blood loss averaged 950 ml (range 500 – 2000 mL). Pathology confirmed a diagnosis of GCL, which included two giant cell granulomas and two giant cell tumors. Postoperative imaging at six months follow-up showed no signs of recurrence; one patient was followed for 1.5 years postoperatively without recurrence. No additional therapy is planned in any of these patients. Review of the literature indicates surgical resection is the most effective form of treatment, though GCL have recurrence rates of up to 72%. Adjuvant pharmacological therapies such as radiation, interferon, intralesional corticosteroids, and tyrosine kinase inhibitors have been shown to be effective in reducing recurrence. Sinonasal GCL with skull base involvement can be managed with endoscopic surgery in most cases but require aggressive surgical removal to prevent recurrence.

Poster #020

**Impact of CFTR therapy on CRS: Deep learning sinus CT analysis, quality of life and productivity loss**

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Matthew Strand  
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David Lynch  
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Introduction:

Elexacaftor+tezacaftor+ivacaftor in triple combination (TC) substantially improves pulmonary function for people with cystic fibrosis (PwCF). This study evaluated the impact of TC modulator therapy on chronic rhinosinusitis (CRS) incorporating computed tomography (CT), quality of life (QOL) and productivity loss (PL).

Methods:

Adult PwCF+CRS with CF transmembrane conductance regulator (CFTR) genotype F508del/F508del or F508del/minimal function who initiated TC therapy were enrolled in a prospective, observational study. The primary endpoint was change in percent of total sinus CT opacification (%SO) after 6 months of TC therapy assessed via deep learning imaging analysis. Secondary endpoints included changes in sinonasal QOL, health utility value (HUV) and PL, which were evaluated monthly via validated metrics.

Results:

30 PwCF met inclusion criteria; 25 completed the study. At baseline, the cohort had substantial CRS, with mean 22-question Sinonasal Outcome Test (SNOT-22) score 33.1 and mean %SO 63.7%. At follow up, %SO improved by mean 22.9% for the entire cohort ( $p < 0.0001$ ). %SO improvement was greater for those without prior modulator therapy ( $p = 0.027$ ) and not altered by genotype or prior sinus surgery. Mean SNOT-22 scores and HUV improved by 12.6 and 0.056, respectively, at 1 month and remained improved at 6 months (all  $p < 0.0024$ ). Presenteeism, activity impairment and overall PL improved over the study course (all  $p < 0.033$ ).

Conclusions:

TC therapy is associated with substantial improvements in sinus CT opacification and clinically meaningful improvements in sinonasal QOL. Multiple measures of PL improved with TC therapy. Many improvements occurred after 1 month of TC therapy and were sustained over time.

## Poster #021

**Impact of COVID-19 on resident otolaryngology training**

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 Thomas Fitzpatrick, Resident  
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## Background:

The COVID-19 pandemic poses a serious challenge to resident medical education, particularly in the field of Otolaryngology-Head and Neck Surgery due to increased risk of surgical exposure to aerosolized airway secretions.

## Methods:

To assess the impact of COVID-19 on Rhinology and Skull Base Surgery (RSBS) training of otolaryngology residents in the USA, a questionnaire was sent out in May to all members of the American Rhinologic Society (ARS). The 34-question survey assessed institutional COVID-19 policies and changes, effects on resident clinical education and safety, and subjective resident interpretation of the pandemic.

## Results:

Residents noted a moderate decrease in involvement with all Otolaryngology patient care, procedures, and clinic visits (5.86/10; 0 = no involvement at all, 5 = moderate decrease in involvement, and 10 = no change in involvement). Residents reported a 6.3 on a 0 to 10 scale (0 being not at worried/affected, 10 being extremely worried/affected) that they were worried of COVID impact on their overall residency education and clinical experience. At 75.34%, the majority of didactic courses have been switched to a virtual format, and 52% of residents reported a cancellation/postponement of their in-person courses. Residents predominantly turned to books, online videos, and journal articles make up for this educational deficit (weighted averages 3.88/5, 3.75/5, and 3.59/5 respectively).

## Conclusions:

This study highlights the significant educational impact that COVID-19 has on Otolaryngology resident training. Further, it presents a potential targeting opportunity for educational resources in response to novel pandemics.

## Poster #022

**Impact of obesity on surgical outcomes in patients with chronic rhinosinusitis undergoing endoscopic sinus surgery**

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## Background:

The association between obesity with the prevalence and severity of sinonasal disease. Including chronic rhinosinusitis (CRS) is well established. However, there is little data regarding the impact of obesity on surgical outcomes in endoscopic sinus surgery (ESS).

## Methods:

A retrospective chart review was performed on all patients who underwent ESS for CRS at our institution between 2014-2019. Data collected included demographic information, medical comorbidities, medication usage, Lund-Mackay (LM) and Modified Lund-Kennedy (MLK) scores. Patients were divided into 3 groups based on BMI: normal (BMI <25), overweight (BMI 25-30), and obese (BMI >30). A subgroup analysis was performed on patients who were designated obese, further dividing them based on obesity severity (BMI: 30-35, 35-40, and >40).

## Results:

A total of 244 patients were included, with 54 having a normal BMI, 86 overweight, and 104 obese. There were no significant demographic differences between groups. There were more patients with diabetes in the obese group ( $p=0.002$ ), but otherwise no other comorbid variation. There was no significant difference in medical management or preop LM scores. There was also no significant difference in MLK scores at the preop, postop, or postop 1-year visit. In our subgroup analysis, we found that patients with BMI >35 had higher MLK scores at their 1-year postop visit, although this was not found to be statistically significant ( $p=0.705$ ).

## Conclusion:

All patients with CRS had improved postoperative outcomes, regardless of BMI. We found that patients with BMI >35 may have worse long-term outcomes, but further investigation, including prospective studies, are needed to determine the impact of obesity on surgical outcomes.

## Poster #023

**Longitudinal analysis of Twitter trends for sinusitis**

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 University of Virginia

**Background:**

Twitter is a social media platform used to share knowledge and communicate with others. Sinusitis is a highly prevalent disease with a significant impact on quality of life, and is well represented on Twitter. However, no prior reports investigate social media activity around this disease. We aimed to describe the qualitative and quantitative features of sinusitis-related tweets, and compare those between the general public and healthcare professionals.

**Methods:**

1.2 million tweets gathered by Symplur Signals containing the keyword 'sinusitis' from March 2012-May 2020 were examined. Tweets were separated into those posted by general public accounts (GPA) versus healthcare accounts (HA). We analyzed total and yearly tweet activity, users, words, hashtags, retweets, terms, sentiment, and links for both user groups.

**Results:**

314,637 relevant tweets were posted by 190,085 users, and the pattern of sinusitis twitter activity was similar to that of overall Twitter activity. GPA tweet activity decreased, while increasing in percentage of replies and mentions. HA tweets increased in activity and proportions of links and media. Retweet activity was higher in GPA users and increased in recent years, but decreased in HA users. GPA reduced posts of original content, and instead engaged with and reposted others' tweets. GPA tweeted most about symptoms, while HA shared treatments. For both groups, the most common words, hashtag, and links were 'sinus' and 'chronic', '#sinusitis', and homeopathic treatments, respectively. Tweets had a positive overall sentiment.

**Conclusion:**

Twitter provides an in-depth understanding of the pattern and topics of conversation held by patients and healthcare providers about sinusitis on social media.

## Poster #024

**Magnetic resonance imaging findings in patients with olfactory dysfunction: A systematic review**

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 Johns Hopkins School of Medicine

**Introduction:**

Patients with acquired, non-traumatic olfactory dysfunction (OD) commonly undergo MRI evaluation to rule out intracranial pathologies. The purpose of this systematic review was to describe MRI findings in patients with non-traumatic OD in order to better understand the utility of MRI as a research and diagnostic tool in this patient population.

**Methods:**

A literature search of PubMed, Embase, Cochrane, Web of Science, and Scopus for studies with original data for patients with OD was completed. Studies with defined olfactory outcomes and reported MRI findings were included. Studies investigating patients with neurocognitive deficits, or those studying traumatic, structural, or congenital etiologies of OD were excluded.

**Results:**

From 1790 candidate articles, 104 studies were reviewed and 25 studies with data for 1640 patients were included. Eleven studies (44%) reported reduced olfactory bulb volume on MRI among patients with post-infectious, idiopathic, and sinonasal etiologies of OD. Five studies (20%) reported gray matter atrophy, specifically in the orbitofrontal cortex (4, 80%), insular cortex (3, 60%), anterior cingulate cortex (3, 60%), parahippocampus (3, 60%), and piriform cortex (3, 60%). Three studies (12%) with 179 patients reported on the incidence of intracranial lesions on MRI, noting parenchymal lesions in 6 patients (3%).

**Conclusion:**

MRI uncommonly detects intracranial pathology in patients with non-traumatic OD. In these patients, reduced olfactory bulb and gray matter volume on MRI are the most commonly identified abnormal findings. Further research is required to better understand the role of MRI and its cost-effectiveness in patients with acquired non-traumatic OD.

Poster #025

**Management of skull base chondromyxoid fibroma: Rare presentation and literature review**

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**Background:**

Chondromyxoid fibroma (CMF) is a rare benign tumor which most commonly presents in the metaphysis of long bones. Fewer than five case reports have described its occurrence in the paranasal sinuses, skull base and orbit. We review available literature on CMF of the paranasal sinuses and skull base and present a case report of CMF involving the orbital apex and optic nerve.

**Methods:**

Literature and case review with unique description of pathology, imaging and management strategies.

**Results:**

58 year old male presented with left retro-orbital pain and normal visual acuity. MRI demonstrated a 2.5 cm extra-axial paraclinoid mass extending to the sphenoid sinus and encasing the left optic nerve and cavernous carotid artery. An endonasal biopsy of the mass confirmed the diagnosis of CMF. Due to severe headaches and desire to prevent future sequelae from optic nerve compression, the patient underwent an expanded endonasal resection and optic nerve decompression. A small amount of tumor was left around the optic nerve and abutting the internal carotid artery given its benign nature and to prevent potentially devastating complications. There was no cerebrospinal fluid leak, and the defect was repaired with a free mucosal graft. The patient is being followed with imaging and an open craniotomy approach will be undertaken should the tumor continue to demonstrate growth.

**Conclusion:**

To our knowledge this is the first case reported of CMF involving the orbital apex, cavernous carotid and optic nerve, which was managed with an expanded endonasal resection and optic nerve decompression. Further research is needed to characterize this extremely rare pathology in the sinonasal and skull base region and develop treatment paradigms.

Poster #026

**Mepolizumab reduces the need for surgery in patients with chronic rhinosinusitis with nasal polyps**

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**Background:**

For patients with chronic rhinosinusitis with nasal polyps (CRSwNP), endoscopic sinus surgery (ESS) can be associated with high recurrence rates despite intranasal corticosteroids (as part of standard of care [SoC]). We assessed the impact of mepolizumab, a humanized anti-interleukin-5 antibody, on the need for repeat ESS in patients with CRSwNP.

**Methods:**

SYNAPSE, a randomized, double-blind, placebo-controlled, multicenter study, enrolled patients with CRSwNP uncontrolled with SoC. All patients had  $\geq 1$  ESS in the past 10 years and were eligible for repeat ESS. Patients received 4-weekly subcutaneous (SC) mepolizumab 100 mg or placebo, plus SoC, for 52 Weeks. We assessed the proportion of patients with a need for ESS (visual analog scale overall symptom score  $>7$ ; endoscopic bilateral NP score  $\geq 5$ ), time to inclusion on a waiting list for ESS (Kaplan–Meier [KM] estimate), and the proportion of patients included on a waiting list, by Week 52.

**Results:**

Data from 407 patients (placebo  $n=201$ ; mepolizumab  $n=206$ ) were analyzed. Mean (SD) duration of CRSwNP was 11.4 (8.4) years; 218 (54%) patients had  $\geq 2$  ESS in the past 10 years. After 52 weeks, more patients using mepolizumab vs placebo were identified as not needing ESS (72% vs 51%, respectively; odds ratio [95% confidence interval] 2.46 [1.59, 3.79];  $P<0.001$ ). KM estimates indicated a ~50% lower risk of inclusion on a waiting list for ESS with mepolizumab than placebo. Up to Week 52, 16% vs 30% of patients using mepolizumab vs placebo were due for ESS on a waiting list.

**Conclusions:**

Mepolizumab 100 mg SC reduces the need for repeat surgery compared with placebo for patients with recurrent CRSwNP despite SoC therapy. Funding: GSK [205687/NCT03085797]

Poster #027

**Minimally invasive endoscopic distraction osteogenesis maxillary expansion (DOME- MinE): Restoring nasal breathing in adult OSA patients with high arched palates**

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Stanley Liu

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Establishing nasal breathing is critical to airway stabilization in the surgical treatment of OSA. Patients with narrow maxilla and high arched palate present with limited response to standard septal, turbinate and valve procedures for nasal obstruction. Distraction osteogenesis maxillary expansion (DOME) has demonstrated efficacy in maxillary expansion for adults with OSA.

A key step in DOME is Lefort I level osteotomy requiring a sublabial approach with midface degloving. To reduce the morbidity involved, we demonstrate a minimally invasive nasal endoscopic (MINE) approach to DOME.

Twelve consecutive subjects underwent MINE-DOME. Ninety percent of subjects completed their maxillary expansion. Nasal obstruction was demonstrably reduced with NOSE score decreasing from 58.89 (19.64) to 16.67 (17.36)  $p=0.004$ . Mean time of cessation of opioid use was 0.89 week. CN V2 hypoesthesia lasted less than 4-8 weeks. There were no complaints of lip mobility.

Maxillary expansion via DOME is effective for the treatment of nasal obstruction in patients with narrow, high-arched maxilla. MINE-DOME further improves subjective outcomes.

Poster #028

**Mucocele of the maxilla as a late complication of maxillary advancement surgery**

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Introduction:

We present a case of a mucocele of the maxilla as a late complication of Lefort I osteotomy.

Case Description:

A 40 year old male with developmental delay and hearing loss presented to the otology clinic for follow up and was incidentally noted to have left facial swelling. On exam he had fullness of the gingiva at the lateral incisor and complete left sided nasal obstruction from medialization of the inferior turbinate. The patient had a remote history of Lefort I osteotomies for maxillary hypoplasia. Maxillofacial computed tomography demonstrated a 4.4 cm expansile lesion in the left alveolar process of the maxilla with extension into the pterygoid space displacing the floor of the maxillary sinus superiorly. Marsupialization of the cyst was performed with partial inferior turbinectomy and opening of a space in the inferior meatus resulting in immediate decompression of the facial and intraoral fullness. This cavity has remained widely patent 3 months postoperatively.

Discussion:

Mucoceles are benign fluid-filled masses that are lined by epithelium, expansile, and frequently occur in the paranasal sinuses. A variety of etiologies have been suggested including previous Caldwell-Luc surgeries, allergies, trauma, infection, congenital origin, and rarely, orthognathic surgery. Maxillary mucoceles are thought to develop as a result of obstruction of the sinus ostia, followed by remodeling and erosion of bone. This case represents a mucocele which developed below the maxillary sinus within the alveolar process of the maxilla. Endoscopic cyst wall removal or marsupialization is the preferred treatment. Increased awareness of this rare complication of orthognathic surgery is important for early diagnosis and treatment.

Poster #029

**Nasoseptal chondromucosal flap for oroantral fistulas**

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**Background:**

Oroantral fistulas (OAFs) most commonly occur iatrogenically from surgical procedures or radiation therapy. While small OAFs may heal spontaneously, large OAFs require surgical intervention, typically using a buccal flap, buccal fat pad flap, or palatal flap. Failure rates of these procedures at one center were 10.2%, 1.7%, and 14.3%, respectively.<sup>1</sup> Repair of anterior skull base defects is commonly performed with a vascularized pedicled mucoperichondrial nasoseptal flap.<sup>2</sup> However, in cases with a high risk of herniation, such as those with larger defects or increased intracranial pressure, a rigid reconstruction may be preferable. We recently demonstrated the feasibility of a nasoseptal chondromucosal flap as an autologous pedicled rigid reconstructive option for orbital and skull base defects.<sup>3</sup> This study aims to assess the feasibility of this approach for repair of oral antral fistulas.

**Methods:**

This study was conducted in a surgical skills lab on one cadaver.

**Results:**

An iatrogenic oroantral fistula was created. A composite nasoseptal chondromucosal flap consisting of mucosa, cartilage, and bilateral perichondrium was harvested. The circular cartilaginous portion was approximately 1 cm in diameter at the distal end of flap. This graft was inset into the iatrogenically created fistula, successfully closing the defect. Transnasal and transoral visualization confirmed appropriate placement of the graft.

**Conclusions:**

A rigid nasoseptal chondromucosal flap may serve as an option for closure of oroantral fistulas. This added structural integrity may be beneficial in cases with high risk of failure. Additional research in vivo is needed.

Poster #030

**Olfactory dysfunction predicts the development of vascular disease in older adults**

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Olfaction is an important modulator of health in older adults. Olfaction may be a signal of underlying morbid disease, such as vascular disease. Microvascular changes are associated with worse olfaction, but the relationship between olfaction and major vascular events is unknown. We examined the relationship between olfactory decline and incident heart attack and stroke in order to investigate the mechanism(s) of atherosclerosis in olfactory impairment and guide preventative care of older adults.

Using longitudinal data from the National Social Life Health and Aging Project (n = 947 older adults), we analyzed the association between odor identification performance and new heart attack and stroke using multivariate logistic regression, adjusting for demographic variables, cardiovascular risk factors, and general health.

Older adults with olfactory decline over 5-years had significantly increased risk of incident heart attack and related mortality at 10-year follow up (OR, 5.28; CI, 2.86 to 9.73). Older adults with olfactory decline also had significantly increased risk of incident stroke and related mortality at 10-year follow up (OR, 2.50; CI, 1.03 to 6.10). Indeed, olfactory decline predicts incident vascular disease and related mortality in a nationally representative sample of community-dwelling older U.S. adults. While previous studies have reported decreased olfaction as an outcome of vascular changes, this study is the first to use olfaction as a predictor of future cardiovascular morbidity and mortality. In an atherosclerotic model of olfactory decline, monitoring changes in olfaction over time may serve as a noninvasive way to monitor microvascular compromise that predates cardiovascular outcomes, such as heart attack.

Poster #031

**Olfactory outcomes after technical variations in transsphenoidal endoscopic skull base surgery**

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**Objectives:**

To describe olfactory outcomes after endoscopic skull base surgery (ESBS) with consideration of differences in approach and reconstruction technique through the 22-item Sino-Nasal Outcome Test (SNOT-22).

**Methods:**

Retrospective review identified 30 patients undergoing transsphenoidal ESBS at a tertiary academic skull base surgery program between July 2018 and May 2020. Approach type was designated as standard or expanded (e.g., maxillary anrostomies, ethmoidectomies), and reconstruction included free mucosal grafting (FMG) or nasoseptal flap (NSF, standard or extended). Preoperative and >4 weeks postoperative SNOT-22 scores were recorded. Outcome variables included subjective smell/taste loss, SNOT-22 subdomains and total scores, and mean time from smell loss to recovery.

**Results:**

The mean time from postoperative loss of smell to recovery was 7.66 weeks (range 2-31), and there were no differences between approach ( $p=0.261$ ) and reconstruction types ( $p=0.321$ ). Furthermore, there were no differences in total SNOT-22 ( $p=0.22$ ) and SNOT-22 domain scores (all  $p>0.05$ ) between approach type. Between reconstruction types, there are increased rhinologic ( $p=0.041$ ) and total SNOT-22 scores ( $p=0.049$ ) with the use of NSF. On post-hoc analysis, we report no significant differences in any outcome variables between standard and extended NSF (all  $p>0.05$ ).

**Conclusion:**

Our findings demonstrate no difference in duration of smell loss recovery between reconstruction types, and no change in postoperative sense of smell quality and duration regardless of approach. NSF use increased rhinologic symptoms in the postoperative period, though there appears to be little added morbidity between use of standard and extended NSFs.

Poster #032

**Otolaryngologist assessment of nasal septum deviation**

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**Objectives:**

A septoplasty is one of the most common procedures to correct for symptoms of nasal septum deviation (NSD). This study aims to identify the challenges that come with diagnosing NSD and explore alternatives in determining the need for surgical intervention.

**Study Design:**

Cross-sectional survey.

**Methods:**

CT scans of 9 confirmed NSD patients and 45 healthy controls (HC) were mixed and emailed through anonymous REDCap surveys to otolaryngologists. The images consisted of a coronal slice at each subject's most deviated location. They were instructed to choose the patients suspected to present with symptoms of sinonasal obstruction. The HC have no reported sinonasal obstruction symptoms - NOSE (NSD:  $62 \pm 13$ ; HC:  $7.4 \pm 8.4$ ,  $p < 0.05$ ); SNOT22 (NSD:  $31.4 \pm 14.5$ ; HC:  $11.4 \pm 12.3$ ,  $p < 0.05$ ).

**Results:**

61 otolaryngologists responded. They identified 61% of symptomatic NSD subjects correctly (sensitivity), but identified 54% of HC as symptomatic (1-specificity). Their decisions were strongly correlated to the degree of NSD measured on their CT ( $r=0.66$ ,  $p < 0.05$ ). Although there is a significant degree of NSD among HC ( $39 \pm 18\%$ ) and symptomatics ( $51 \pm 18.7$ ,  $p=0.09$ ) these groups do not significantly differ. Residents and fellows performed similarly, with responses correlated between levels of training ( $r=0.84-0.96$ ,  $p < 0.05$ ).

**Conclusions:**

The novel incorporation of a substantial number of otolaryngologists, large patient sample, and blind mixing with HC gives us greater insight to the relative value of NSD in clinical decision making. Although NSD is a common etiology of nasal obstruction, the results of this study suggest that otolaryngologists are not able to reliably infer symptoms based on CT findings or degree of NSD alone.

## Poster #033

**Postoperative pain management after hereditary hemorrhagic telangiectasis lesion coblation: A prospective study**

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## Introduction:

Coblation has been shown to be as effective as laser photocoagulation for epistaxis treatment and patients reported a significant decrease in nasal obstruction symptoms. Despite the work in understanding opioid prescribing patterns and predictors of postoperative pain, there has not been prior study in postoperative pain control in patients with HHT nor a discussion of the available options.

## Methods:

This is a longitudinal, prospective cohort study of adult patients undergoing endoscopic coblation for treatment of HHT telangiectasias with or without bevacizumab injection between November 2019 and March 2020 at a single academic university hospital.

## Results:

Fourteen cases, including 13 unique patients, were included in this study. Opioids were ordered on discharge in four cases and the average morphine milligram equivalent prescribed on discharge was 41. The median pain score on postoperative day (POD) two was four of ten. Twelve patients reported using acetaminophen and four were using opioid pain medications. Of those using opioid pain medications, the average total MME used by POD two was 40. Only one patient was using opioid pain medication by POD four and denied any use after POD ten.

## Discussion:

This study is the first to analyze postoperative pain management and opioid prescribing patterns in HHT patients undergoing endonasal coblation of telangiectasias. Postoperative pain was mild to moderate and most patients stopped using opioid medications by POD four, although the majority of patients solely used acetaminophen. Future studies with increased sample size will be useful to further identify predictors of need for analgesics postoperatively and other non-opioid adjuncts for pain control.

## Poster #034

**Predictors of post-operative nausea and vomiting after endoscopic skull base surgery**

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 Emily Nguyen  
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 Benjamin Bitner  
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## Objectives:

To evaluate the impact of surgical approach and reconstruction type during endoscopic skull base surgery on post-operative nausea and vomiting episodes.

## Methods:

We performed a retrospective chart review from July 2018 through August 2020 of 99 patients undergoing endoscopic skull base surgery at a tertiary academic skull base surgery program. All patients were treated with a standardized post-operative protocol consisting of scheduled ondansetron, with promethazine and scopolamine for breakthrough nausea and vomiting episodes. Cumulative nausea and vomiting episodes throughout hospital stay were recorded for each patient.

## Results:

Of the 99 patients identified, the mean number of nausea and vomiting episodes were 0.43 +/- 1.16 and 0.26 +/- 0.72, respectively. There were no differences in number of nausea episodes based on lesion size, cavernous sinus and suprasellar involvement, approach type, and reconstruction type ( $p > 0.05$  for all variables). Both cavernous sinus involvement (OR 1.53, 95% CI, 1.09-2.13;  $p = 0.014$ ) and extended approach (OR 1.59, 95% CI, 1.06-2.41;  $p = 0.025$ ) significantly increased odds of postoperative vomiting episodes. Increased nausea or vomiting episodes both did not significantly increase odds of prolonged hospitalization ( $p = 0.227$  and  $0.535$ , respectively).

## Conclusion:

We report an effective postoperative nausea and vomiting medication regimen for patients undergoing endoscopic skull base surgery. Nausea episodes did not significantly differ by extent of approach or reconstruction type. Cavernous sinus involvement and extended surgical approach were both predictive of increased postoperative vomiting episodes.

Poster #035

**Profuse intraoperative hemorrhage in a hereditary hemorrhagic telangiectasia patient: A case report**

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**Introduction:**

Hereditary Hemorrhagic Telangiectasia (HHT) is an autosomal dominant disorder leading to multiple telangiectasias and arteriovenous malformations (AVM), especially in the nasal cavity. These fragile telangiectasias cause chronic epistaxis that requires multiple ablative procedures throughout a patient's lifetime. We present the case of an HHT patient who developed massive oro-nasal hemorrhage after anesthetic induction, which required emergent tracheotomy, oro-nasal packing, and neuro-interventional embolization.

**Methods: Case Report**

**Case Presentation:** A 51 year old man with HHT presented with a lifelong history of epistaxis as well as a known AVM. His epistaxis was refractory to medical therapy, multiple in-office and operative nasal procedures as well as neuro-interventional embolization. Ultimately, the decision was made to perform another operative ablation of nasal telangiectasias. Upon arrival in the OR, while laying supine, anesthesia was induced with propofol and with subsequent mask ventilation initiated. Immediately, there was profuse oro-nasal bleeding preventing mask ventilation. The larynx could not be visualized via direct or video laryngoscopy so an emergent tracheotomy was performed as the patient was desaturating. He ultimately required neuro-interventional embolization of a maxillary artery AVM to control the hemorrhage and was eventually discharged after a prolonged hospital stay without any neurologic sequelae.

**Conclusion:**

HHT patients have an increased risk for upper airway bleeding due to numerous nasal telangiectasias and providers should always be prepared to control large volume epistaxis and establish a secure airway in these patients at any time.

Poster #036

**Reduction in visits to emergency department for acute rhinologic and allergic complaints during COVID-19 pandemic**

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**Background:**

Since the COVID-19 pandemic began, emergency departments (ED) across the United States have witnessed a decrease in the number of patients presenting with acute conditions, including stroke and myocardial infarction. Through the lens of two hospital systems in New York City, this study aims to evaluate whether a similar phenomenon has occurred with otolaryngology and allergy complaints.

**Methods:**

We conducted a retrospective study of patients who presented to the ED at two tertiary care hospital systems with primary diagnoses of acute rhinologic or allergic complaints, including epistaxis, facial trauma, sinusitis, allergic rhinitis, anaphylaxis, and angioedema, from March 1-May 31 in 2019 and 2020 (pre-COVID and COVID, respectively).

**Results:**

A total of 10162 patients were identified with 24 distinct otolaryngologic and allergic diagnoses. Significantly fewer patients presented to the ED in 2020 as compared to 2019: 7332 (72.2%) vs 2830 (27.8%),  $p < 0.0001$ . Significant reductions in the number of cases of all diagnoses were seen including allergic rhinitis: 81 (77.1%) vs 24 (22.9%),  $p < 0.0001$ ; sinusitis: 93 (69.4%) vs 41 (30.6%),  $p < 0.0001$ ; epistaxis: 367 (69.1%) vs 158 (30.1%),  $p < 0.0001$ ; facial trauma: 219 (68.6%) vs 100 (31.4%),  $p < 0.0001$ ; anaphylaxis: 105 (75.5%) vs 34 (24.5%),  $p < 0.0001$ ; and angioedema: 31 (70.4%) vs 13 (29.6%),  $p = 0.0033$ .

**Conclusions:**

The COVID-19 pandemic was associated with a decrease in the number of patients presenting to EDs with acute rhinologic and allergic diagnoses, including high acuity diseases such as anaphylaxis. In an effort to ensure safe patient care, particularly for highly morbid conditions, it is imperative that we better understand the factors that have contributed to this phenomenon.

Poster #037

**Safety of nasopharyngeal swabs: are patients getting the accurate recommendations?**

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During the COVID-19 pandemic, the nasopharyngeal swab (NPS) is being used as the most common tool to collect samples for COVID-19 diagnosis. However, NPS insertion into the nasal cavity is not suitable for some patients. Those who have undergone sinus and skull base surgery may be at higher risk for cerebrospinal fluid leak and other injury due to NPS testing. Given that the Internet is a common place for patients to seek medical information, we desired to see if doctors and institutions had updated online patient handouts to inform sinus and skull base surgery patients about their increased risk of injury due to COVID-19 NPS testing. We found that none of the 200 websites we analyzed contained such information. We recommend multiple interventions for otolaryngologists and health care professionals who order or administer COVID-19 testing that could notably increase the safety of patients at risk of injury due to NPS insertion.

Poster #038

**Severe bilateral orbital subperiosteal abscesses in a patient with Woakes Syndrome**

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Meghan Turner, Assistant Professor of Otolaryngology

Chris Roberts, Resident

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A 58-year-old Caucasian man with history of chronic nasal dyspnea complained of worsening right then left eyelid swelling, redness and pain despite 3 days of oral amoxicillin/clavulanate. He also reported blurry doubled vision. The symptoms began 8 days prior without trauma, fever, or nasal discharge. His past medical history was significant for nasal fractures from a bicycle crash at age 12 with subsequent anosmia and nasal dyspnea. He denies asthma or aspirin allergy. Exam was significant for 20/30 vision bilaterally with marked limitation of ocular motility, left eye proptosis and 3 mm lagophthalmos, telecanthus, and widening of the nasal bridge. The left > right orbits were firm with fluctuance, erythema and induration. There were choroidal folds of the left eye. Nasal endoscopy revealed severe bilateral polyposis. Contrast CT displayed bilateral pansinusitis, osteitic changes in frontal and sphenoid sinuses, soft tissue nasal obstruction, ablation of the floor of the frontal sinuses contiguous with large superior subperiosteal abscesses. The patient underwent bilateral transnasal endoscopic polypectomy with maxillary antrostomy, uncinectomy, anterior ethmoidectomy, and anterior orbitotomy with drainage of subperiosteal orbital abscesses. His ocular discomfort and nasal breathing improved. He was continued on broad spectrum antibiotics and corticosteroids with continued improvement at followup 1 week after surgery with plans for further polypectomy and possible dupilumab therapy.

**Conclusion:**

Woakes Syndrome is a rare chronic polyposis that can lead to severe sinusitis and nasal triad destruction. To our knowledge, this is the first reported case of bilateral severe orbital abscesses requiring urgent intervention.

Poster #039

**Simultaneous use of endoscopic and endovascular technique to control refractory epistaxis**

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Seth Lieberman, Attending Physician and Principal Investigator

Epistaxis is a common medical condition with approximately 60% of the adult population experiencing at least one episode in their lifetime. While most cases resolve spontaneously, up to 6% require medical attention. When conservative measures fail, surgical intervention is necessary. Endoscopic sphenopalatine artery ligation (ESPAL) is successful in 89% of cases, however when even this fails, angiography and embolization of the responsible vessel is the next step in treatment. Bleeding from the anterior ethmoidal artery can pose a treatment dilemma as it cannot be safely embolized given risk of blindness, but may only be accessible to endoscopic ligation in 20% cases. Ligation often requires an external approach carrying increased morbidity. Here we present a case of a 34-year old female presented with recurrent epistaxis in the setting of recent traumatic nasal bone fractures. Conservative management with nasal packing failed so patient underwent endoscopic cauterization and ESPAL. This provided temporary hemostasis however patient had recurrent epistaxis several days later. On endovascular angiography the anterior ethmoid artery was localized as the source of bleeding. This was unable to be embolized due to risk of blindness. A novel approach of endoscopic control with cauterization under direct fluoroscopic guidance with angiography was performed with excellent hemostasis. No additional epistaxis occurred on follow-up. We present a unique approach for control of epistaxis with endoscopic cauterization under direct angiographic guidance in severe refractory epistaxis of the anterior ethmoidal artery system with multiple failed prior interventions. This approach was successful in achieving prolonged hemostasis.

Poster #040

**Sinus culture differences between patients with radiographic signs of odontogenic sinus disease**

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Reed Gardner

Deanne King

Alissa Kanaan, MD

Introduction:

Odontogenic sinusitis is a well-known entity with a different pathogenesis than chronic rhinosinusitis. Nonspecific symptoms can make diagnosis difficult. This study aims to compare culture results between patients with and without computed tomography findings indicative of possible odontogenic disease.

Methods:

This was a retrospective cohort study in which patients undergoing endoscopic sinus surgery for chronic sinusitis from 2017-2019 at a single institution were reviewed. CT imaging was reviewed for evidence of periapical lucency, dehiscence of the floor of the maxillary sinus, oroantral fistula, or foreign body. Culture results were then assessed and compared between groups with CT evidence of a possible odontogenic source to those without.

Results:

Overall, 231 patients were evaluated. 92 patients (39.8%) were found to have evidence of a likely odontogenic source on CT. Cultures were available for 118 of 231 patients (51.1%). Patients with CT signs concerning for odontogenic disease were significantly more likely to grow proteus mirabilis ( $p = 0.018$ ) and klebsiella pneumoniae ( $p = 0.037$ ) on culture. Patients without CT signs of odontogenic sources were significantly more likely to grow pseudomonas aeruginosa ( $p = 0.009$ ). Of note, patients with CT findings concerning for an odontogenic source were also more likely to grow fungi other than aspergillus and mucor on culture ( $p = 0.004$ ).

Conclusion:

Patients with CT findings concerning for an odontogenic source of sinus disease showed differences in culture results that could be important in differentiating pathogenesis of sinus disease.

Poster #041

**Sinusitis in the Bronx: zimpact of demographics, patient characteristics, and socioeconomic status on disease epidemiology and outcomes**

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**Background:**

Socioeconomic status (SES) has a known association with chronic rhinosinusitis (CRS), but its impact on surgical outcomes is limited. Past studies have evaluated majority white or non-impovertished populations. We sought to examine outcomes of endoscopic sinus surgery (ESS) for CRS in a racially and socio-economically diverse population.

**Methods:**

We performed a retrospective chart review of patients who underwent ESS for CRS between 2014-2019. Using zip codes to determine median household incomes, patients were divided into low-income (LIG; <\$38,467) or high-income groups (HIG; >\$38,467) according to the median Bronx household income. Outcome measures included preop and postop Lund-Mackay (LM) and Modified Lund Kennedy (MLK) scores measured one year after surgery, medications, and number of follow up visits.

**Results:**

A total of 249 patients were included, with 131 and 118 patients in the LIG and HIG, respectively. The mean follow-up time was 15.4 months. There were significantly more Hispanic/Latinos in the LIG than in the HIG (53% vs 28%,  $p < 0.001$ ). Preop and immediate postop MLK scores were similar for both groups. At 1 year follow up, the LIG had higher MLK scores (1.59 vs 1.49,  $p=0.77$ ); the overall reduction in MLK scores after 1 year was greater in the HIG (2.91 vs 2.48,  $p=0.339$ ). However, neither change reached statistical significance. There was no significant difference in medication usage, days to surgery, or total follow up days.

**Conclusion:**

Despite our evaluation of a racially and socio-economically diverse population, SES did not play a significant impact on surgical outcomes in patients with CRS in the Bronx. However, further study is needed to evaluate for longer term disparities in surgical outcomes.

Poster #042

**Survey of anesthesiologists on topical vasoconstrictors and intravenous tranexamic acid for endoscopic sinus surgery**

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Garret Choby, MD, FARS  
Patrick Bolton, Dr.  
Michael Marino, MD, FARS  
Toby Weingarten, Dr.  
Ian Humphreys, DO, FARS  
Sabrina Dhillon, Dr.  
Byeong Choi, Dr.  
Roman Fernandez, Mr.  
Philip Chen, MD, FARS  
University of Texas Health Science Center at San Antonio

**Background:**

Topical vasoconstrictors and intravenous tranexamic acid (IV TXA) are safe and efficacious to decrease bleeding and improve the surgical field during endoscopic sinus surgery (ESS). The purpose of this study was to investigate practice patterns, awareness of clinical evidence, and comfort levels among anesthesia providers regarding these hemostatic agents for ESS.

**Methods:**

767 attending anesthesiologists, residents, and certified registered nurse anesthetists (CRNAs) at 5 United States academic centers were invited to participate in a survey regarding their experience with IV TXA and 3 topical vasoconstrictor medications (oxymetazoline, epinephrine, and cocaine) during ESS.

**Results:**

330 (47%) anesthesia providers responded to the electronic survey. 113 (97%) residents, 92 (83%) CRNAs, and 52 (68%) attendings managed five or fewer ESS cases per month. Two-thirds of providers had not reviewed efficacy or safety literature for these hemostatic agents. Oxymetazoline was perceived safest, followed by epinephrine, IV TXA, and cocaine. Respondents considered potential side effects over surgical field visibility when selecting agents. The majority of providers had no formal training on these agents for ESS, but indicated interest in educational opportunities.

**Conclusion:**

Many anesthesia providers are unfamiliar with safety and efficacy literature regarding agents used to improve hemostasis for ESS, highlighting a need for development of relevant educational resources. Rhinologic surgeons have an opportunity to communicate with anesthesia colleagues on the use of hemostatic agents to improve the surgical field during ESS.

Poster #043

**The power of Twitter to identify novel symptoms in COVID-19**

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Lydia Weykamp  
Marc Vetter  
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**Introduction:**

By March 2020, altered smell/taste was a recognized symptom of COVID-19. This study asks if this symptom could have been identified sooner through Twitter. It analyzes the public discourse of altered smell/taste in COVID-19 on Twitter compared to published sources and describes how the discussion changed over time.

**Methods:**

Public tweets mentioning COVID-19 from 1/22/2020 – 5/31/2020 were collected via Harvard's Twitter Stream API and analyzed for search terms selected a priori relating to altered smell/taste. Two independent evaluators categorized these tweets as diagnosis, outcome, quality of life, treatment/management, mechanism, educational, or other/awareness. Pearson's chi-squared test was used to analyze tweets by category and month.

**Results:**

2589 tweets of the 68 million analyzed met screening criteria. The earliest tweet mentioning a connection occurred on February 9th. The earliest similar statements from formal sources did not occur until March 20th and 22nd. Immediately after their release, the rate of tweets about altered smell/taste peaked at 127.10 per 100,000 COVID-19 tweets on March 23rd. Tweet content shifted from citing published sources 39.6% of the time in March to 24.8% in May ( $x^2 = 41.13$ ,  $p < 0.001$ ). In contrast, tweets about using loss of smell/taste for diagnosis increased from 7.7% in March to 23.3% in May ( $x^2 = 70.96$ ,  $p < 0.001$ ).

**Conclusion:**

Tweets about altered smell/taste in COVID-19 occurred over a month prior to published statements making Twitter a means to identify symptoms in novel disease outbreaks. However, formal sources can shape the volume and content of public discourse as evidenced by the spike in tweets and change in tweet focus following their publications.

Poster #044

**Transeyelid orbitotomy approach for isolated type IV frontal cell pathology: A case series and systematic review of the literature**

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Liza Cohen  
Michael Chu  
Marilene Wang, MD, FARS  
Jivianne Lee, MD, FARS  
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UCLA

**Background:**

A transeyelid orbitotomy approach (TOA) may be utilized to access the lateral frontal sinus, with or without functional endoscopic sinus surgery (FESS). This is the first case series to describe an isolated TOA to diseased lateral Type IV frontal cells.

**Methods:**

Between 2014 and 2020, two patients underwent a TOA to marsupialize Type IV frontal cells. Patient and tumor characteristics, radiographic imaging, operative findings, and follow-up data were retrospectively collected. A systematic review of the literature using the PubMed/MEDLINE, EMBASE, and Cochrane databases was conducted to review the TOA.

**Results:**

The TOA resulted in excellent exposure of the lateral frontal sinus and superior orbital rim and roof. In one case, a pre-existing dehiscence of the superior orbital rim permitted access to the cell, while in the other case, a small osteotomy of the anterior table of the frontal sinus was created to access the cell. A mucocele and a cholesterol granuloma, respectively, were removed within the cells, followed by marsupialization of the cells into the true frontal sinus cavities. The TOA alone was successful in treating the Type IV cells without FESS. Both patients had resolution of preoperative symptoms with good cosmetic outcomes and preserved forehead sensation. Neither patient developed orbital or intracranial complications or recurrences. A systematic review showed that the TOA is an effective and minimally invasive approach to a variety of fronto-orbital pathologies.

**Conclusions:**

The TOA is a feasible, safe, and quick technique for direct access to the frontal sinus for lesions not accessible via FESS or to avoid unnecessary sinus dissection. It may be used as an adjunctive or alternative procedure.

Poster #045

**Transorbital-transsinus resection of sinonasal malignancies with extraconal orbital invasion**

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**Background:**

Traditionally, orbital exenteration has been the standard approach for the treatment of locally advanced malignancies with extraconal orbital invasion. However, to preserve ocular function, surgeons have employed techniques that allow preservation of vision. Minimally invasive transorbital-transsinus (TOTS) resection, performed by an otorhinolaryngologist in concert with an oculoplastics surgeon, offers oncologic resection while preserving ocular function when used in conjunction with multi-modality therapy.

**Methods:**

Retrospective case series of patients with paranasal sinus malignant tumors with extraconal orbital invasion treated with TOTS resection between June 2015 and November 2020 was performed.

**Results:**

Five patients (3 men, 2 women; mean age, 66.8 years, range 57-68 years) underwent TOTS resection with a mean follow up time of 20.2 months (range 5-54mo). Four patients had T4aN0M0 squamous cell carcinoma (SCCa) of the paranasal sinuses and one patient had invasive inverting papilloma. Among the SCCa patients; 2 received adjuvant concurrent chemotherapy and radiation therapy (CXRT), 2 received adjuvant RT and 1 received neoadjuvant CXRT. Vision was preserved in all patients. All patients remain free of local or distant recurrence.

**Conclusions:**

TOTS resection, performed by a multispecialty team as part a multimodality treatment regimen for the treatment of sinonasal malignant tumors with extraconal orbital invasion, offers good oncologic outcomes with the preservation of vision. This approach may be considered as a less invasive and less morbid alternative to orbital exenteration. Further study is necessary to define the indications and final outcomes of this procedure.

Poster #046

**Unusual cause of acute sinusitis and orbital abscess in COVID-19 positive patient**

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Stephen Dryden

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**Background:**

Peptoniphilus indolicus is not usually seen in the eye or paranasal sinuses but is a commensal of the human vagina and gut. However, with COVID-19, eye infections and other unusual complications are possible with such unsuspected bacteria.

**Case Presentation:**

The patient is a 76-year-old male from a nursing home that tested positive for COVID-19 and was sent from a nursing facility for left eye drainage and psychiatric evaluation. Upon presentation, the patient was not fully oriented and could not provide a history of the eye drainage. CT scan showed sinusitis with left orbital and periorbital abscess formation, cellulitis, and extensive osteomyelitis. He underwent endoscopic transnasal drainage and orbitomy. Cultures returned positive for methicillin-resistant *Staphylococcus aureus* (MRSA), *Streptococcus constellatus*, and *Peptoniphilus indolicus*. He was maintained on several days of IV antibiotics and returned to the nursing home. He then presented 2 months later and required enucleation of his globe, due to the presence of multiple scleral perforations in the setting of an orbital abscess, as well as removal of necrotic orbital bone.

**Conclusions:**

Given the concomitant infection with COVID-19 and unusual presentation, the patient's sinus cultures support the notion that COVID-19 can affect the presence of bacteria within certain anatomical regions. Specifically, *Peptoniphilus indolicus* is not normally found outside of the vagina or gut biome.

Poster #047

**Workforce analysis of allergy immunotherapy Medicare provider**

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Samantha Scott  
Steven Silver  
Albany Medical Center

**Introduction:**

Currently, the composition of the allergy immunotherapy (AIT) treatment workforce is not well described.

**Objective:**

The aim of this study is to review the composition of AIT healthcare providers, their differences in geographic distribution, volume of services, Current Procedural Terminology (CPT) codes billed, as well as Medicare reimbursement.

**Methodology:**

Medicare Provider Utilization and Payment Data from 2017 was used to collect data on CPT codes from 95144 to 95170, 95115, and 95117. Fisher's least significant difference (LSD) test was used to compare Medicare reimbursement across healthcare provider groups.

**Results:**

In 2017, 10,473 healthcare providers performed 9,640,780 AIT services for 509,291 Medicare beneficiaries. Texas followed by Florida and California had the highest number of AIT providers. The breakdown of specialties involved were as followed: Allergy/Immunology (51.64%), Otolaryngology (32.29%), Mid-level providers (5.91%), Internal Medicine (3.65%), Family Medicine (3.04%), Pulmonology (1.20%), and Others (2.27%). The volume of services of all the specialties, except Mid-level providers, remained stable from 2012 to 2017.

**Conclusion:**

Allergy/Immunology and Otolaryngology stably dominated the AIT treatments in the Medicare population.



# SAVE THE DATE 2021

**10<sup>th</sup> Annual  
SUMMER  
SINUS  
SYMPOSIUM**  
American Rhinologic Society

**Housing:** <https://book.passkey.com/go/ARSSummerSinusSymposium2021>

## Summer Sinus Symposium

*Best Sinus Course in the World: Improving Rhinology from Office to OR*

**July 23-25, 2021**

**Marriott Austin Downtown Hotel  
Austin, TX**

**Registration:** <https://cvent.me/M8BN7k>

**MEETING HIGHLIGHTS**

- **Keynote Address: From ethmoiditis to Everest: Perspectives on sinus infections, physical burnout, and renewal**  
Guest Speaker: Paul Pottinger, MD, FACP, FIDSA  
Professor of Medicine, Division of Allergy & Infectious Diseases; Director, Infectious Diseases Training Program; Co-Director, UWMC Antimicrobial Stewardship Program Head, UWMC General ID Section; Director, UWMC Tropical Medicine & Infectious Diseases Clinic  
University of Washington Medical Center
- Expanded cadaver prosections
- New dedicated allergy program
- Symposia sessions



## ARS 67th Annual Meeting October 1-2, 2021

**Millennium Biltmore Hotel  
Los Angeles, CA**

Abstract submission opened: 4/12/2021  
Abstract submission deadline: 5/3/2021

**MEETING HIGHLIGHTS:**

- 17th Annual David W. Kennedy Lectureship
- Presidents Welcome & Poster Reception
- Women in Rhinology, Mentorship, Residents & Fellows, and Diversity Programs
- Poster Hall
- Exhibit Hall
- Resident's Cadaveric Lab (Limited Space)

**Contact: Wendi Perez, ARS Executive Administrator**  
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