



# PROGRAM GUIDE

## ARS 68th Annual Meeting

September 9-10, 2022 | Philadelphia Marriott Downtown Hotel, Philadelphia, PA

The ARS Welcomes the  
*ARS Guest Countries*  
Mexico and United Kingdom  
*AAO-HNS Guest Countries*  
Argentina, Japan, Nigeria,  
Poland, Spain



## **FALL FILM FESTIVAL**

The ARS will again be featuring the **Fall Film Festival** - a **video seminar** featuring the most educational, unique and impressive videos of cases, complications and challenges submitted by the membership.

The videos were reviewed by an appointed committee and rated equally on rarity of pathology, technical complexity, novelty of procedure, educational value, and production quality. The top-rated videos (time-permitting) will be showcased at the meeting with an opportunity for the video editors to introduce each clip and respond to questions from the audience.

**Friday, September 9, 2022**  
**12:00 - 1:00 pm**  
**Salon B, 5th Floor**



*RODNEY SCHLOSSER, MD, FARS*

## Presidential Welcome

I am excited to welcome everyone to our 68th Annual ARS Meeting in Philadelphia! Sarah Wise, our President-Elect and Program Chair, has put together an outstanding educational meeting. The highlight will be our David W. Kennedy Lecture given by Claire Hopkins, BMBCH, FRCS (ORLHNS).

Claire has been active in the rhinology community for many years in Europe and internationally and is a thought leader in rhinology research and clinical care. During the COVID pandemic, she was instrumental in conducting research and sharing it with colleagues around the world and we are so grateful that she will be traveling from London to spend time with us in Philadelphia.

In addition to Claire's lecture, there will be numerous presentations on the latest treatments for COVID-anosmia, clinical trial data on topical therapies for CRS and current utilization of biologics and drug eluting stents for nasal polyposis. Additional panels will cover a wide spectrum of topics from the role of the rhinologist in cough to medical contracts to cutting edge basic science and translational research. I look forward to the new Hwang Family Lectureship given by James Stankiewicz, MD, FARS on "Mentorship... it goes both ways". As you can see there is something of interest for everyone!

It has been a privilege to serve as the ARS President for the past year and I look forward to seeing everyone in Philadelphia.

Rodney Schlosser, MD, FARS  
*President, American Rhinologic Society*





SARAH K. WISE, MD, FARS

## Welcome from the President Elect and Program Chair

We are excited to welcome you to the 2022 American Rhinologic Society Annual Meeting!

The ARS has now hosted several successful in-person meetings during the COVID era. We look forward to sharing excellent educational and networking experiences with you once again as we gather in Philadelphia at the Marriott Downtown, September 9-10, 2022.

The program for the ARS Annual Meeting is packed with innovative research, timely and informative panels, and thought-provoking keynote lectures. This meeting will not disappoint!

Highlighting original research, over 70 abstracts were accepted for oral scientific presentation, along with more than 100 posters. These presentations cover various aspects of rhinology, allergy, smell and taste, immunology, biologic therapies, basic and translational science, sinonasal tumors, skull base surgery, and more. Many thanks to the research teams, presenters and moderators, and the abstract review committee whose collective work will provide a high quality scientific program for the Annual Meeting attendees.

We are extremely honored to have Professor Claire Hopkins present the David W. Kennedy lecture this year, titled "Improving Outcomes from Sinus Surgery: What are we Missing?" In addition, this will be the inaugural year of the Hwang Family Lecture, a newly established lectureship dedicated mentoring and mentorship. Dr. James Stankiewicz will give the first Hwang Family Lecture, titled "Mentorship: It Goes Both Ways"

The ARS Annual Meeting has several break-out rooms on Saturday morning, which are designed to grab the interest of meeting attendees across various aspects of rhinology. Our ARS Women in Rhinology, Allergy and Immunology, and Skull Base and Orbital Sections were instrumental in planning educational sessions in some of these break-out rooms.

Panels and group discussions at the 2022 ARS Annual Meeting will highlight various innovative and interesting topics, including Artificial Intelligence and Machine Learning in Rhinology, Orbital Decompression, Skull Base Malignancy and Reconstruction, Unified Airway, Diversity in Rhinologic Research, Climate Change and its effect on Rhinologic Disease, Immune Deficiencies and Sinusitis, Cough, and The Future of Rhinology. We look forward to the thought-provoking presentations, questions, and discussions that contribute to the success of these sessions.

Friday's session will be capped off with the President's Reception, which offers a great venue for networking and social interaction with colleagues. Additional learning opportunities are available at the Saturday morning Meet the Authors Poster Viewing and Breakfast, as well as several industry-sponsored satellite symposia occurring during breakfast and lunch hours throughout the meeting. Finally, the combined Women in Rhinology, Mentorship, and Diversity & Inclusion Saturday Lunch will feature Simone S. Hicks, JD, speaking on "Medical Contracts and Negotiations from a Legal Perspective."

Many thanks in advance to our speakers, planners, and attendees. We sincerely appreciate your continued support and engagement with the American Rhinologic Society. Have a great meeting, everyone!

Sarah K. Wise, MD, FARS  
*President-Elect/Program Chair*





## American Rhinologic Society Executives - 2022



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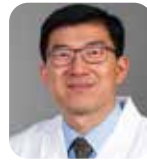
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## ARS Mission Statement

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

The ARS designates this live activity for a maximum of *10.75 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

### How to Obtain Your CME Certificate

Go to [ARS.CmeCertificateOnline.com](https://www.ars.cmecertificateonline.com) and click on "ARS 68th Annual Meeting" link. On the site, you will be asked to evaluate the overall conference. A certificate will be made available for you to print. Questions? Email [Certificate@AmedcoEmail.com](mailto:Certificate@AmedcoEmail.com)

## Learning Objectives

Upon completion of this session, participants should be able to:

- Discuss the current evidence-based recommendations regarding the medical and surgical management of acute rhinosinusitis and chronic rhinosinusitis and be able to implement new strategies into clinical practice
- Comprehend both benign and malignant neoplastic disease involving the nose and paranasal sinuses as well as current strategies for clinical surgical management and long-term surveillance
- Describe the pathophysiology, clinical presentation, diagnostic testing, and management of patients with allergic and immunologic disorders



## Meeting WiFi

Network: Marriott Network

Password: ARS22



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## ARS 2022 FRIENDS IN RESEARCH DONORS

Thank you to all donors who have helped get the 2022 Friends in Research Campaign off to a great start! We thank you for your generosity! With the monies donated over the past few years the ARS has been able to continue the Friends in Research sponsored grant which is in addition to our traditional CORE efforts! New this year the ARS is also offering a three-year, multi-site Consortium Grant.

With your support, we can continue to fund the studies that provide clinical insights valuable to the care of our patients. This work not only advances the care of our patients through scientific innovation, but also generates important data establishing the efficacy and cost effectiveness of our care. In the current financial landscape, this is equally important to ensure that our patients have access to the treatment necessary to address their complaints. We thank you again for your help in this worthy endeavor!

Visit [american-rhinologic.org](http://american-rhinologic.org) and join us in our 2022 year campaign.

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1987 - 1988	Alvin Katz, MD	2019 - 2020	Robert Kern, MD, FARS
1988 - 1989	Donald Leopold, MD, FARS*	2020 - 2021	Joseph Han, MD, FARS
1990 - 1991	Pierre Arbour, MD		

\*Deceased

## Past Secretaries

2019 - Present	Rakesh Chandra, MD, FARS
2015 - 2019	Pete Batra, MD, FARS
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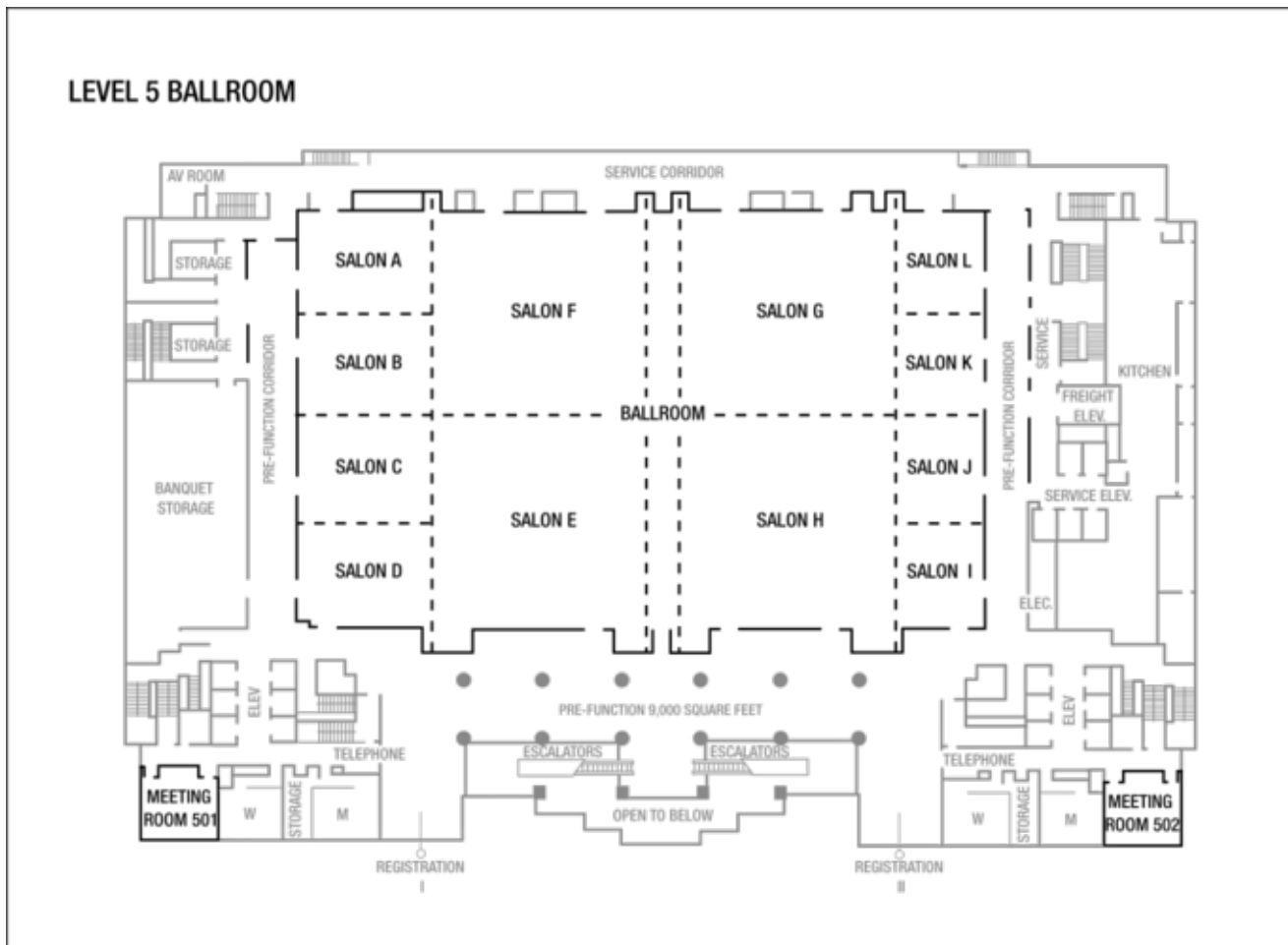
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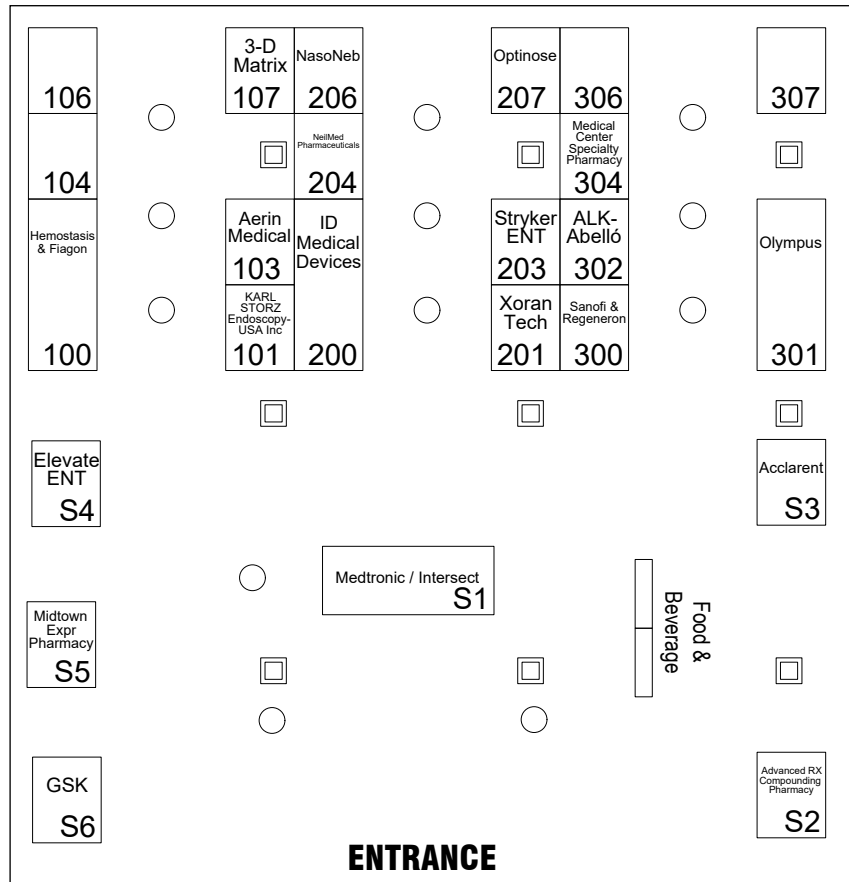
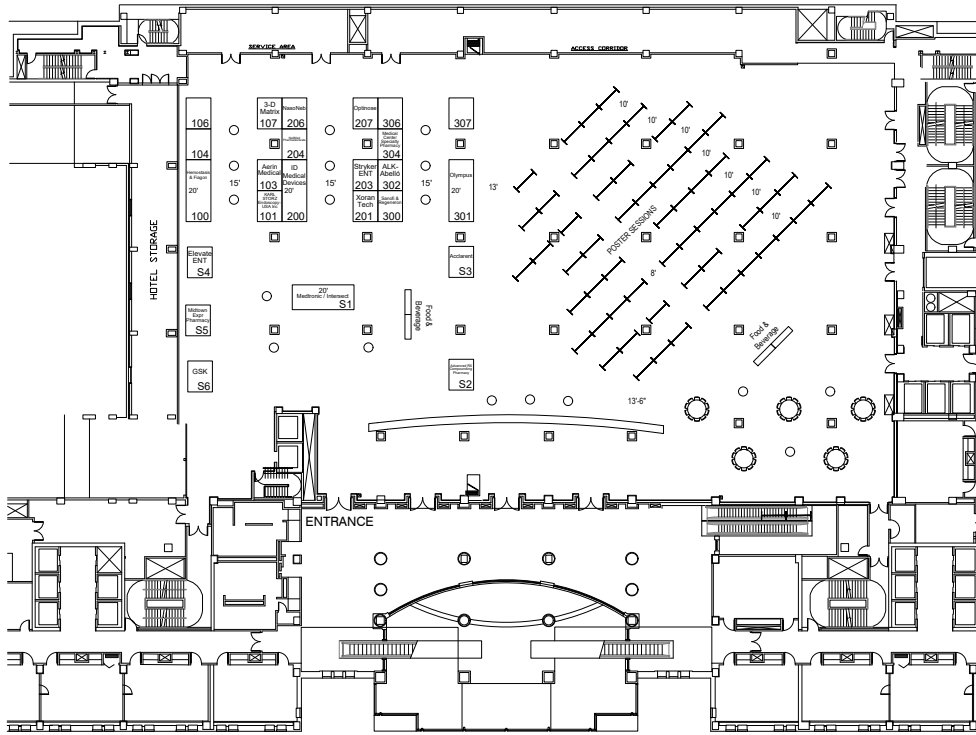
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# Floor Plan



# Exhibit Hall



## PROGRAM AT A GLANCE

## Thursday, September 8, 2022

### Salon C/D

12:00 pm – 5:00 pm  
Resident Course – Didactic Session  
By Invitation Only

### Liberty Ballroom 2/3

6:00 pm – 7:00 pm  
Residents Reception  
By Invitation Only

## Friday, September 9, 2022

1:00 pm – 5:00 pm

### General Session Salon H/I/J

1:00 pm - 1:05 pm  
**Welcome**  
Sarah Wise, MD, FARS

1:05 pm - 1:15 pm  
**Presidential Address**  
Rodney Schlosser, MD, FARS

### Top Rated Abstracts – Clinical Rhinology

*Moderators: Waleed Abuzeid, MD, FARS; Edward McCoul, MD, FARS; Marilene Wang, MD, FARS*

1:15 pm - 1:22 pm  
**EPX as a biomarker for tissue eosinophilia in chronic rhinosinusitis regardless of polyp status**  
Devyani Lal, MD, FARS

1:23 pm - 1:30 pm  
**Re-Open-1: A randomized double-blind placebo-controlled trial of EDS-FLU for CRSwNP or CRSsNP**  
James Palmer, MD, FARS

1:31 pm - 1:38 pm  
**Randomized controlled trial of the effect of TXA on epistaxis following sinonasal surgery**  
Ashoke Khanwalkar, MD

1:39 pm - 1:46 pm  
**Chitogel post-ESS promotes healthy microbiome and reduces post-operative infections**  
Anna Megow

1:47 pm - 1:54 pm  
**Platelet-rich plasma for COVID-19 smell loss, a randomized controlled trial**  
Carol Yan, MD

1:55 pm - 2:05 pm  
**Q&A**

2:05 pm - 2:15 pm  
**Awards Ceremony**  
Jean Kim, MD, FARS; Jivianne Lee, MD, FARS

2:15 pm - 3:00 pm  
**David W. Kennedy Lecture**  
“Improving outcomes from sinonasal surgery – What are we missing?”  
Introduction: Sarah Wise, MD, FARS  
Guest Speaker: Professor Claire Hopkins, BMBCH, FRCS (ORLHNS)

3:00 pm - 3:30 pm  
**Break with Exhibitors in Franklin Hall**

### Top Rated Abstracts – Basic and Translational Science

*Moderators: Naweed Chowdhury, MD; Kara Detwiler, MD, FARS; Nyall London, MD, FARS*

3:30 pm - 3:37 pm  
**Epigenetics in chronic rhinosinusitis vs. controls**  
Tripti Brar, MBBS, MD

3:38 pm - 3:45 pm  
**CST1 is an upstream initiator of epithelial derived type 2 inflammation in a murine model**  
Alan Workman, MD

3:46 pm - 3:53 pm  
**Impact of ambient PM2.5 on differentiated human nasal epithelial cell function and viability**  
Juliana Theorell

3:54 pm - 4:01 pm  
**Hypoxia-induced CFTR dysfunction is a mechanism underlying reduced mucociliary transport in CRS**  
Do-Yeon Cho, MD

4:02 pm - 4:09 pm  
**CRS related S. aureus strains demonstrate enhanced pathogenicity**  
Simon Goldie

4:10 pm - 4:20 pm  
**Q&A**

4:20 pm - 5:00 pm  
**Panel: Artificial intelligence and deep machine learning in rhinology**  
Moderator: Zara Patel, MD, FARS  
Panelists: David Gudis, MD, FARS; Michael Marino, MD, FARS; Edward McCoul, MD, FARS

5:15 pm - 7:00 pm  
**President's Welcome Reception**  
Liberty Ballroom

## Saturday, September 10, 2022

8:00 am – 3:15 pm

### Breakout A Salon H/I/J

7:00 am – 8:00 am  
**Meet the Authors Poster Viewing & Breakfast**  
Franklin Hall

### Skull Base & Orbital Surgery Section Session

8:00 am – 8:30 am  
**Panel: Nuances of orbital decompression**  
Moderator: Mindy Rabinowitz, MD, FARS  
Panelists: Benjamin Bleier, MD, FARS; Judd Fastenberg, MD; Kibwei McKinney, MD; Michael Rabinowitz, MD

8:30 am – 9:15 am  
**Panel: Skull base malignancy – case discussion with the experts**  
Moderator: Garret Choby, MD, FARS  
Panelists: Mathew Geltzeiler, MD, FARS; Richard Harvey, MD, FARS; Devyani Lal, MD, FARS; James Palmer, MD, FARS

### Endoscopic Endonasal Sella and Skull Base Surgery

*Moderators: Emily Barrow, MD; Corinna Levine, MD, FARS; Mathew Geltzeiler, MD, FARS*

9:15 am - 9:21 am  
**Postoperative management following endoscopic skull base reconstruction**  
Khodayar Goshtasbi

9:22 am - 9:28 am  
**Endocrinopathy risk factors after transsphenoidal surgery**  
Jake Lee, MD



## PROGRAM AT A GLANCE

9:29 am - 9:35 am

**Outcomes after clinical care pathway implementation for EEA approach for sellar pathologies**

Aamr Hasanjee

9:36 am - 9:42 am

**Frailty does not impact postoperative outcomes in extended endonasal skull base surgery**

Rijul Kshirsagar, MD

9:43 am - 10:00 am

**Q&A**

10:00 am - 10:30 am

**Break with Exhibitors in Franklin Hall****Sinonasal Tumors and Orbital Surgery***Moderators: Anthony Del Signore, MD; Patricia Loftus, MD, FARS; Nicholas Rowan, MD*

10:30 am - 10:36 am

**Effect of sarcopenia on survival outcomes in patients with nasopharyngeal and sinonasal cancer**

Peter Kim, MD

10:37 am - 10:43 am

**A multi-institutional survey of sinonasal lymphoma outcomes over the past 20 years**

Jacob Eide, MD

10:44 am - 10:50 am

**Volume and survival in endoscopic surgery for sinonasal squamous cell carcinoma**

Benjamin Bitner, MD

10:51 am - 10:57 am

**Orbital resection by intranasal technique (ORBIT) staging system**

Aria Jafari, MD

10:58 am - 11:04 am

**Risk of frontal sinusitis after orbital decompression**

Parker Tumlin

11:05 am - 11:15 am

**Q&A**

11:15 am - 12:00 pm

**Panel: Skull base reconstruction options beyond the naso-septal flap**

Moderator: Eric Wang, MD, FARS

Panelists: Emily Barrow, MD; Corinna Levine, MD, FARS; Katie Phillips, MD; Raj Sindwani, MD, FARS

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm - 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Luncheon**

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

**Biologics***Moderators: Cecelia Damask, DO; Jose Mattos, MD; Lauren Roland, MD*

1:00 pm - 1:06 pm

**Real world analysis of dupilumab for nasal polyposis not meeting proposed biologic use guidelines**

Isaac L. Schmale, MD

1:07 pm - 1:13 pm

**Dupilumab treatment delays in asthma and chronic rhinosinusitis with nasal polyps**

Samiat Awosanya

1:14 pm - 1:20 pm

**Computational fluid dynamic analysis of improved olfaction after dupilumab**

Thomas Lepley

1:21 pm - 1:27 pm

**Efficacy of dupilumab in allergic fungal rhinosinusitis**

Juan Carlos Hemaiz

1:28 pm - 1:34 pm

**Impact of dupilumab on sinonasal outcomes in patients with AERD refractory to other biologics**

Glen D'Souza

1:35 pm - 1:45 pm

**Q&A**

1:45 pm - 2:00 pm

**HOT TOPICS: What's on the horizon? Biologics for nasal polyposis**

Speakers: Kent Lam, MD, FARS; Lauren Roland, MD

2:00 pm - 2:45 pm

**Panel: Unified airway update**

Moderator: Kevin Welch, MD, FARS

Panelists: John Bosso, MD; Cecelia Damask, DO; Claire Hopkins, MD; Anju Peters, MD

2:45 pm - 3:15 pm

**Break with Exhibitors in Franklin Hall****Saturday,  
September 10, 2022****8:00 am – 12:00 pm****Breakout B  
Salon A/B**

7:00 am – 8:00 am

**Meet the Authors Poster Viewing & Breakfast**  
Franklin Hall**Chronic Rhinosinusitis  
Histology and Treatment***Moderators: Angela Donaldson, MD, FARS; Elisabeth Ference, MD, FARS; Ashoke Khanwalkar, MD*

8:00 am - 8:06 am

**Histopathologic differences in adult and elderly patients with CRS**

Hannah Brown

8:07 am - 8:13 am

**Medical therapy for CRS is associated with a decrease in disease burden and type 2 inflammation**

Eli Stein

8:14 am - 8:20 am

**Long-acting corticosteroid matrices improve CRS cardinal symptoms**

Brent Senior, MD, FARS

8:21 am - 8:27 am

**Effect of dupilumab on eustachian tube dysfunction in patients with CRS**

Michael Chang, MD

8:28 am - 8:34 am

**Salicylate limited diet in aspirin exacerbated respiratory disease**

Diana Bigler

8:35am - 8:45 am

**Q&A**

## PROGRAM AT A GLANCE

**Women in Rhinology Section Session**

8:45 am – 9:30 am

**Panel: Ensuring diversity in rhinologic research**

Moderators: Elina Toskala, MD, FARS and Troy Woodard, MD, FARS

Panelists: Sandra Brooks, MD; Claire Hopkins, MD

9:30 am – 9:40 am

**Anatomy, physiology, psychology, pathology of the female vs male nose and sinuses**

Speaker: Devyani Lal, MD, FARS

9:40 am – 9:50 am

**Sex-based differences in access and outcomes in rhinology and neurorhinologic procedures**

Speaker: Vijay Ramakrishnan, MD, FARS

9:50 am – 10:00 am

**Guidelines in managing rhinologic pathology in pregnancy**

Speaker: Satish Govindaraj, MD, FARS

10:00 am - 10:30 am

**Break with Exhibitors in Franklin Hall****Sinus Surgery I**

Moderators: Kristine Smith, MD; Zachary Soler, MD, FARS; Abtin Tabaee, MD, FARS

10:30 am - 10:36 am

**Medical and surgical treatments of chronic rhinosinusitis share common mechanisms of action**

Audrey Pelletier, PhD

10:37 am - 10:43 am

**Systematic review: biologics versus surgery in CRSwNP**

Nirushan Narendran

10:44 am - 10:50 a

**Bioabsorbable drug eluting microsphere for frontal sinus surgery**

Tripti Brar

10:51 am - 10:57 am

**Effect of nasal packing saturated with ciprofloxacin and dexamethasone following sinus surgery**

Norman Orabi, MD

10:58 am - 11:15 am

**Q&A****Sinus Surgery II**

Moderators: Mark Arnold, MD; Philip Chen, MD, FARS; Ashleigh Halderman, MD, FARS

11:15 am - 11:21 am

**Comparison of endoscopic Draf 2 and Draf 3 procedure outcomes in CRSwNP**

Samuel Racette, MD

11:22 am - 11:28 am

**Maxillary sinus volume changes after surgery in silent sinus syndrome**

Juan Carlos Hernaiz

11:29 am - 11:35 am

**The effectiveness of postoperative gabapentin for reduction of opioid consumption and pain control**

Hong-Ho Yang

11:36 am - 11:42 am

**Tobacco use increases the risk of CRS among patients undergoing ESS**

Amarbir S. Gill, MD

11:43 am - 11:49 am

**The impact of resident and fellow participation on outcomes following endoscopic sinus surgery**

Karandeep Randhawa

11:50 am - 12:00 pm

**Q&A**

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm – 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Luncheon**

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

**Saturday, September 10, 2022****8:00 am – 12:00 pm****Breakout C Salon C/D**

7:00 am – 8:00 am

**Meet the Authors Poster Viewing & Breakfast**  
Franklin Hall**Allergy and Immunology in Rhinology Section**

8:00 am – 8:45 am

**Panel: Climate change is its effect on rhinologic disease**

Moderator: Jean Kim, MD, FARS

Panelists: Regan Bergmark, MD, FARS; Kent Lam, MD, FARS; Amber Luong MD, PhD, FARS; Darryn Waugh, MD; Ben Zaitchik, MD

8:45 am – 9:15 am

**Immune Deficiencies and sinusitis**

Moderator: Chadi Makary, MD, FARS

Panelists: Antoine Azar, MD; Sandra Lin, MD, FARS

**Allergy and Rhinitis**

Moderators: Charles Ebert, MD, FARS; Katie Phillips, MD;

Joshua Levy, MD, FARS

9:15 am - 9:21 am

**Cost-effectiveness of inferior turbinate reduction vs immunotherapy for allergic rhinitis**

Michael Yong, MD

9:22 am - 9:28 am

**Real-world SLIT persistence and adherence**

Michelle Park

9:29 am - 9:35 am

**Variability in sinonasal allergen deposition explains asymmetric involvement in CCAD**

Daniel Spielman, MD

9:36 am - 9:42 am

**Vidian nerve diameter: A possible association with chronic rhinitis diagnosis**

Megha Chandna

9:43 am - 9:49 am

**Cost-effectiveness of in-office posterior nasal nerve ablation**

Anirudh Saraswathula

9:50 am - 10:00 am

**Q&A**

## PROGRAM AT A GLANCE

10:00 am - 10:30 am  
Break with Exhibitors in Franklin Hall

## Smell and Taste

*Moderators: Daniel Beswick, MD, FARS; Sanjeet Rangarajan, MD, FARS; Carol Yan, MD*

10:30 am - 10:36 am  
**Social determinants of health and olfactory dysfunction in older adults: A population-based analysis**  
Eli Stein

10:37 am - 10:43 am  
**Correlation of computed tomography scores to measures of olfaction**  
Tiffany Chen

10:44 am - 10:50 am  
**Will septoplasty improve my sense of smell? A prospective observational study**  
Grant Gillman

10:51 am - 10:57 am  
**Gabapentin for COVID-19 induced Parosmia**  
Do-Yeon Cho, MD

10:58 am - 11:04 am  
**Taste loss correlation with cognition**  
Shahzeb Hasan

11:05 am - 11:15 am  
**Q&A**

## Rhinosinusitis Diagnosis and Associated Conditions

*Moderators: David Jang, MD, FARS; Edward Kuan, MD, FARS; Mindy Rabinowitz, MD, FARS*

11:15 am - 11:21 am  
**Increased prevalence of eosinophilic esophagitis in patients with CRS**  
Arthur Wu, MD, FARS

11:22 am - 11:28 am  
**Inflammatory endotype of odontogenic sinusitis**  
John Craig, MD, FARS

11:29 am - 11:35 am  
**Evaluation and work-up of immunodeficiencies in recurrent acute rhinosinusitis: A scoping review**  
Jessica Lin

11:36 am - 11:42 am  
**Importance of sinus cultures in patients with acute exacerbations of CRS**  
Jessa Miller, MD

11:43 am - 12:00 pm  
**Q&A**

12:00 pm - 1:00 pm  
**Lunch with Exhibitors in Franklin Hall**

12:00 pm - 1:00 pm  
**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Luncheon**  
Guest Speaker: Simone S. Hicks, JD  
"Medical Contracts and Negotiations from a Legal Perspective"  
Salon E

## Saturday, September 10, 2022 8:00 am - 2:45 pm Breakout D Salon K/L

7:00 am - 8:00 am  
**Meet the Authors Poster Viewing & Breakfast**  
Franklin Hall

## Rhinology All Around

*Moderators: Stephanie Joe, MD, FARS; Jonathan Mallen, MD; Theodore Schuman, MD, FARS*

8:00 am - 8:06 am  
**Hospital ownership status effect on nasal bone fracture outcomes and cost of care**  
Maham Ahmad

8:07 am - 8:13 am  
**Clinical characteristics of patients with TMJ arthritis presenting as CRS**  
Norman Orabi, MD

8:14 am - 8:20 am  
**A quantitative approach to measurement of nasal medication irrigation**  
Jeffrey J. Falco

8:21 am - 8:27 am  
**Teaching sinus anatomy: efficacy of self-directed online sinonasal anatomy learning modules**  
Eric Bailey, MD

8:28 am - 8:34 am  
**Feedback improves E/M billing**  
Amarbir Gill, MD

8:35 am - 8:45 am  
**Q&A**

8:45 am - 9:25 am  
**Panel: Moving rhinology forward - high impact rhinology research**  
Moderator: Stephanie Shintani-Smith, MD  
Panelists: Benjamin Bleier, MD, FARS; Murray Ramanathan, MD, FARS; Bruce Tan, MD, FARS

## Cerebrospinal Fluid Leaks and Biomarkers

*Moderators: Edward El Rassi, MD; Tran Locke, MD; Sonya Marcus, MD*

9:25 am - 9:31 am  
**Assessment of CSF biomarkers for cognitive impairment in patients with sinonasal inflammation**  
Nathaniel Reeve

9:32 am - 9:38 am  
**Optic nerve sheath diameter correlates to intracranial pressure in spontaneous CSF leak patients**  
Ashwini Tilak

9:39 am - 9:45 am  
**Multi-institutional spontaneous CSF leak case-control study**  
Pedro Escobedo

9:45 am - 9:51 am  
**Subjective symptoms and signs of postoperative cerebrospinal fluid leak**  
Jonathan Pang, MD

9:51 am - 10:00 am  
**Q&A**

10:00 am - 10:30 am  
**Break with Exhibitors in Franklin Hall**

10:30 am - 11:15 am  
**Panel: ARS society structure - how to get involved!**  
Moderator: Joshua Levy, MD, FARS  
Panelists: Amber Luong, MD, PhD, FARS; Brent Senior, MD, FARS; Timothy Smith, MD, FARS; Michael Stewart, MD, FARS



## PROGRAM AT A GLANCE

**Basic and Translational Science**

Moderators: Naveen Bhandarkar, MD, FARS;  
Do-Yeon Cho, MD; Esther Kim, MD

11:15 am - 11:21 am

**Interferon-induced olfactory mucosal inflammation elicits an immune response in the olfactory bulb**

Andrew Lane, MD, FARS

11:22 am - 11:28 am

**Simvastatin as a topical anti-inflammatory**

Nyssa Farrell, MD

11:29 am - 11:35 am

**Impact of topical probiotics on differentiated human nasal epithelial cell function and viability**

Juliana Theorell

11:36 am - 11:42 am

**Host immune response differences to fungus in healthy subjects and sinus mycetoma patients**

Estephania Candelo

11:43 am - 12:00 pm

**Q&A**

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm – 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Luncheon**

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

1:00 pm - 1:45 pm

**Panel: Cough -- where does the rhinologist fit in?**

Moderator: Abtin Tabaei, MD, FARS

Panelists: John Bosso, MD; Rakesh Chandra, MD, FARS; Patricia Loftus, MD, FARS; Anais Rameau, MD

1:45 pm - 2:00 pm

**HOT TOPICS: Central compartment atopic disease: recent evidence, knowledge gaps, future understanding**

Speaker: John Del Gaudio, MD, FARS

**Health Disparities, Disease Burden, and Patient Outcomes**

Moderators: Regan Bergmark, MD, FARS; Victoria Lee, MD; Elina Toskala, MD, FARS

2:00 pm - 2:06 pm

**Health disparities among adults with sinusitis in the United States**

Eric Wei, MD

2:07 pm - 2:13 pm

**The impact of priming on rhinologic patient reported outcome measures**

Nathan Yang

2:14 pm - 2:20 pm

**Correlation between SNOT-22 and cardinal symptom composite scores in CRS**

Brent Senior, MD, FARS

2:21 pm - 2:27pm

**Chronic rhinosinusitis productivity and activity impairment**

Vivek Pandrangi, MD

2:28 pm - 2:34 pm

**Validation of the novel postoperative polyp scale (POPS)**

Arthur Wu, MD, FARS

2:35 pm - 2:45 pm

**Q&A**

2:45 pm - 3:15 pm

**Break with Exhibitors in Franklin Hall**

**Saturday, September 10, 2022**

**3:15 pm – 5:00 pm**

**General Session**

**Salon H/I/J**

3:15 pm - 3:25 pm

**Business Meeting & Presidential Citations**

Michael Stewart, MD, FARS; Rodney Schlosser, MD, FARS

3:25 pm - 3:30 pm

**Introduction of Hwang Family Lectureship**

Peter Hwang, MD, FARS

3:30 pm - 4:15 pm

**Hwang Family Lectureship**

Guest Speaker: James Stankiewicz, MD, FARS

"Mentorship... It Goes Both Ways"

4:15 pm - 5:00 pm

**ARS/AAOA Panel – The Future of Rhinology**

Moderator: Jennifer Villwock, MD

Panelists: Dana Crosby, MD, FARS; Sandra Lin, MD, FARS; Anju Peters, MD; James Stankiewicz, MD, FARS

**Meeting Adjourns**

## PROGRAM AT A GLANCE

## POSTERS

Poster 001

**Adjuvant chemoradiation therapy following surgical resection of sinonasal malignancies**  
Lena Kheir, BA

Poster 002

**Adoption of posterior nasal nerve cryoablation as a treatment for rhinitis**  
Allan Wang

Poster 003

**Adverse events following endoscopic sinonasal surgery**  
Ariel Omiunu

Poster 004

**Age in acute rhinosinusitis**  
Aman M. Patel, BS

Poster 005

**Ameloblastoma transnasal endoscopic resection**  
Neeraj Suresh, BS

Poster 006

**Anemia in skull base fractures**  
Aman M. Patel, BS

Poster 007

**Anemia in transsphenoidal pituitary surgery**  
Joel Feier, BA

Poster 008

**Anteriorly based middle turbinate flap: A cadaveric study and case series**  
Viraj M. Patel, MD

Poster 009

**Association between intraoperative findings and post-ESS endotype in patients with CRS**  
Eli Stein

Poster 010

**Association between research productivity and NIH funding in academic rhinology**  
Delphine Gardiner

Poster 011

**Association between SARS-CoV-2 and other respiratory viruses in sudden smell loss**  
Marcel Miyake, MD, PhD

Poster 012

**Association of allergic rhinitis and asthma with chronic rhinosinusitis and adenoiditis in children**  
Ian Sunyecz, DO

Poster 013

**Asthma in endoscopic sinus surgery**  
Abhijit Bhattar, BA

Poster 014

**Attitudes of perioperative communication and patient safety in rhinology**  
Maria Armache, MD

Poster 015

**Biologic use in nasal polyps**  
Jared Silver

Poster 016

**Biphenotypic sinonasal sarcoma: Case report with literature review**  
Edie Threlkeld

Poster 017

**Carcinosarcoma of the nasal cavity and paranasal sinuses: A review of the national cancer database**  
Jacob Harris, BA

Poster 018

**Chronic rhinosinusitis symptoms in CRS patients before and during the COVID-19 pandemic**  
Michela Borrelli, BA

Poster 019

**Clinical predictors of successful symptom improvement following eustachian tube balloon dilation**  
Hong-Ho Yang, BS

Poster 020

**Comparing the severity of chronic rhinosinusitis symptoms before vs. during the COVID-19 pandemic**  
Jasmine Lin, BA

Poster 021

**Complications of absorbable intranasal packing: An analysis of the MAUDE database**  
Meryl Kravitz, MD

Poster 022

**COVID-19 and pituitary surgical volume trends**  
Mandy Salmon, BS

Poster 023

**Craniopharyngioma outcomes in children versus adults**  
Mandy Salmon, BS

Poster 024

**Cystic Fibrosis in pediatric chronic rhinosinusitis**  
Aman M. Patel, BS

Poster 025

**Depression in benign pituitary neoplasm**  
Aman M. Patel, BS

Poster 026

**Deviated nasal septum in chronic rhinosinusitis**  
Aman M. Patel, BS

Poster 027

**Deviated nose entire framework approach**  
Mohsen Naraghi, MD, FARS

Poster 028

**Delayed onset CSF rhinorrhea: An alternative presentation of post-traumatic meningoencephalocele**  
Samantha Newman

Poster 029

**Diabetes mellitus in orbital cellulitis**  
Joel Feier, BA

Poster 030

**Disease-specific quality of life outcomes following anterior skull base surgery**  
Amarbir Gill, MD

Poster 031

**Disparities in access to healthcare**  
Robert Hagedorn, BS

Poster 032

**Dupilumab impact on SNOT-22 items and association with objective outcomes in CRSwNP**  
Joaquim Mullol, MD, PhD

Poster 033

**Dynamics of dupilumab response in CRSwNP**  
Claire Hopkins, BMBCH, FRCS (ORLHNS)

Poster 034

**Effects of delays in care in chronic rhinosinusitis patient's symptom severity and Outcomes**  
Michela Borrelli, BA

Poster 035

**Efficacy of olfactory training in treatment of post-viral vs post-traumatic olfactory dysfunction**  
Krishna Hanubal, BS

Poster 036

**Endoscopic transnasal stenting of an obliterated eustachian tube: Case report of a novel technique**  
Victor Hsue, MD

## PROGRAM AT A GLANCE

- Poster 037  
**Evaluation of PGISS Score as a measure of CRS disease activity**  
Subin Lim
- Poster 038  
**Exacerbated host-immune responses by the interaction between RV-C and the CDHR3 risk allele**  
Sunny Palumbo, PhD
- Poster 039  
**Exploring sociodemographic factors in allergic fungal rhinosinusitis**  
Peter Debbaneh, MD
- Poster 040  
**Gastro-esophageal reflux disease in transsphenoidal pituitary surgery**  
Joel Feier, BA
- Poster 041  
**Glomangiopericytoma: A case series**  
Natalie Schauwecker, MD
- Poster 042  
**Granulomatosis with polyangiitis and chronic rhinosinusitis**  
Chengetai Mahomva, MD
- Poster 043  
**Growth in endoscopic sinus cancer surgery over time**  
Sina Torabi, MD
- Poster 044  
**Hospital frailty risk score as a predictor of postoperative outcomes in sinonasal malignancies**  
Rema Anisha Kandula, MD
- Poster 045  
**Hospital profit status in acute rhinosinusitis**  
Aman M. Patel, BS
- Poster 046  
**Hospital region in pediatric acute rhinosinusitis**  
Joel Feier, BA
- Poster 047  
**Hypothyroidism in endoscopic sinus surgery**  
Abhijit Bhattaru, BA
- Poster 048  
**Iatrogenic rhinolith in a new American: Case report and review of the literature**  
Daniel Mitchell, BS
- Poster 049  
**Identification of dendritic cells in CRS-associated nasal polyps by immunohistochemistry**  
Amelia Lawrence
- Poster 050  
**WITHDRAWN**
- Poster 051  
**Improving accuracy of maxillary balloon dilation using virtual reality navigation: Proof of concept**  
Kevin Grafmiller, MD
- Poster 052  
**Income in benign pituitary neoplasm**  
Aman M. Patel, BS
- Poster 053  
**Income in Black and Hispanic patients with skull base fractures**  
Aman M. Patel, BS
- Poster 054  
**Intrinsic nasal fibro-fat in rhinoplasty**  
Mohsen Naraghi, MD, FARS
- Poster 055  
**Invasive fungal sinusitis - do topical steroids present a risk?**  
Jessica Bishop, MD
- Poster 056  
**July effect in orbital cellulitis**  
Joel Feier, BA
- Poster 057  
**Landmark and techniques for in-office sphenopalatine ganglion block**  
Francesco Caruana
- Poster 058  
**MAUDE database analysis for adverse events associated with eustachian tube dilation**  
Sarah Jeoung, BS
- Poster 059  
**Medical malpractice trends in endoscopic orbital surgeries**  
Rachna Goli, BS
- Poster 060  
**Medicating the olfactory cleft: Nasal spray vs. drops in kaiteki position**  
Daniel Spielman, MD
- Poster 061  
**Medication compliance in allergic fungal sinusitis of the frontal sinus and its impact on recurrence**  
Eun Jeong
- Poster 062  
**Mepolizumab versus Dupilumab for chronic rhinosinusitis with polyps**  
Kent Tadokoro, MD
- Poster 063  
**Metabolomics in sinusitis**  
Michael Armstrong, MD
- Poster 064  
**Metastatic prostate cancer to the sinuses**  
Alexandra Michalowski, MD
- Poster 065  
**WITHDRAWN**
- Poster 066  
**Modified technique significantly improves efficacy for in-office posterior nasal nerve ablation**  
Alexander Choi, MD
- Poster 067  
**Musculoskeletal and connective tissue disease in orbital cellulitis**  
Anthony M. Saad, BA
- Poster 068  
**Nasal cytology in patients treated with biologic therapies**  
Rafael Hijano, MD PhD
- Poster 069  
**WITHDRAWN**
- Poster 070  
**Nasal polyps in pediatric chronic rhinosinusitis**  
Aman M. Patel, BS
- Poster 071  
**Nonresponders to interleukin-5 inhibitors in CRSwNP**  
Maggie Donovan, Medical Student
- Poster 072  
**Optimizing success in dacryocystorhinostomy**  
Hanna Luong, BS
- Poster 073  
**Osteoradionecrosis of the skull base**  
Sunny Shah, Medical Student
- Poster 074  
**Otolaryngologist perceptions of AI-based CT sinus interpretation**  
Conner Massey, MD
- Poster 075  
**Outcomes of Dupilumab treatment in patients presenting with severe asthma or CRSwNP, over 65**  
Keisha Best, MS



## PROGRAM ABSTRACTS

Poster 076

**WITHDRAWN**

Poster 077

**Patient versus provider Twitter perspectives on sinusitis**

Shahzeb Hasan, BS

Poster 078

**Pediatric chronic rhinosinusitis with Cystic Fibrosis**

Matt Lelegren, MD

Poster 079

**Pediatric retronasopharyngeal abscess causing erosive skull base osteomyelitis**

Jordan Teitelbaum, DO

Poster 080

**Pediatric transnasal odontoid resection: A single institution experience**

Michael Ye, MD

Poster 081

**Pituitary apoplexy and HIV**

Jennifer E. Douglas, MD

Poster 082

**Preoperative laboratory testing in low-risk patients undergoing septorhinoplasty—A NSQIP study**

Priyanka Singh, BA

Poster 082A

**Presence of the CDHR3 risk allele in CRS patients increases the odds of sinun infections**

Nirushan Narendran

Poster 083

**Prevalence and associated factors of cognitive dysfunction in patients with chronic rhinosinusitis**

Ashton Lehmann, MD

Poster 084

**Price transparency for outpatient rhinology procedures**

Vincent Abiona, MD, MPH

Poster 085

**WITHDRAWN**

Poster 086

**Resident involvement as a predictor of complications in endoscopic sinus surgery**

Bella Onwumbiko, MD

Poster 087

**Rethinking invasive fungal rhinosinusitis**

Amanda Bastien, MD

Poster 088

**Retronasal olfaction in CRS**

Joel James, BS

Poster 089

**Retrospective study of angiofibroma**

Mohsen Naraghi, MD, FARS

Poster 090

**Rhinosinusitis in hematopoietic stem cell transplant patients**

Yi-Tsen Lin, MD

Poster 091

**Risk factors of venous thromboembolism following endonasal endoscopic skull base surgery**

Cecilia Nguyen

Poster 092

**Risk of inpatient epistaxis admission related to oral anticoagulation medication use**

Margaret Mitchell, MD, MS-HPED

Poster 093

**Sex in acute rhinosinusitis**

Aman M. Patel, BS

Poster 094

**Sinonasal complications of SARS-CoV-2: A single center case series**

Eric Lee

Poster 095

**Sinus and skull base anatomic tool for junior trainees**

Anirudh Saraswathula, MD, MS

Poster 096

**Sinus involvement in chronic rhinosinusitis**

Aman M. Patel, BS

Poster 097

**Sinus involvement in pediatric acute rhinosinusitis**

Joel Feier, BA

Poster 098

**Sinus surgery versus biologic therapy in CRSwNP patients**

Nirushan Narendran, MS

Poster 099

**Sleep apnea in epistaxis**

Joel Feier, BA

Poster 100

**Social determinants of health (SDoH) and sino-nasal outcome test (SNOT-22) scores**

Taylor Cave

Poster 101

**Social media perceptions on the rhinology industry**

David Moffatt

Poster 102

**Socioeconomic disparities in the treatment and survival of sinonasal malignancies after surgery**

Lena Kheir, BA

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**Solitary neurofibroma of the posterior septum**

Luis Fernando Macias-Valle, MD, FARS

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**Staphylococcus aureus pathoadaptation in chronic rhinosinusitis**

Ghais Houtak, MD

Poster 105

**WITHDRAWN**

Poster 106

**Surgical completeness in AERD patients**

John Lee, MD

Poster 107

**Surgical management of orbital lesions associated with GPA: Case report**

Jillian O'Shaughnessy, BA, BS

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**Symptom-free days in patients with CRSwNP treated with dupilumab**

Claire Hopkins, BMBCh, FRCS (ORLHNS)

Poster 109

**Systematic review of endoscopic management of sinonasal adenoid cystic carcinoma**

Michael Ye, MD

Poster 110

**The CRS mention the top ten most costly physical health condition with a prevalence of 11%**

A H M Delwar, MBBS

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**The incidence of revision functional endoscopic sinus surgery in Pott's Puffy Tumor**

Samantha Newman

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**The modification of the flow in the nose and the paranasal sinuses (PNS) before and after FESS-documented with Computational Fluid Dynamics**

Jochen Schachenreiter, MD

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**The prevalence, duration, and outcome of anosmia in COVID-19 patients**

Anas AL Tammam, MD

Poster 114

**Toxic shock syndrome after sinonasal surgery: A systematic review**

Timothy Shim, MD

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**Transnasal endoscopic transpalatal advancement for the treatment of OSA**

Kevin McLaughlin, MD

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**Transsphenoidal? The tumor is already filling the sphenoid!**

Jordan Teitelbaum, DO

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**Trends in clinical trials for olfactory dysfunction in COVID-19**

Vickie Wang

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**Twitter trends for sinusitis**

Shahzeb Hasan, BS

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**Unilateral pediatric chronic rhinosinusitis**

Matt Lelegren, MD

Poster 120

**Urinalysis dipsticks for differentiating patients with diverse sinus complaints**

Michela Borrelli, BA

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**Zygomatic implant salvage and treatment of implant-related CRS with medial maxillectomy**

Gajaan Sittambalam, MSAnnual Residents

## PROGRAM ABSTRACTS

**Thursday, September 8, 2022****Salon A/B**

12:00 pm – 5:00 pm

Resident Course – Didactic Session

**Liberty Ballroom 2/3**

6:00 pm – 7:00 pm

Residents Reception

*By Invitation Only***Friday, September 9, 2022**

7:00 am – 12:00 pm

**Salon E**

7:00 am - 8:00 am

Board of Directors Breakfast

8:00 am - 12:00 pm

Board of Directors Meeting

**Friday, September 9, 2022**

1:00 pm – 5:00 pm

**General Session****Salon H/I/J**

1:00 pm - 1:05 pm

**Welcome**

Sarah Wise, MD, FARS

1:05 pm - 1:15 pm

**Presidential Address**

Rodney Schlosser, MD, FARS

**Top Rated Abstracts – Clinical Rhinology***Moderators: Waleed Abuzeid, MD, FARS, ; Edward McCoull, MD, FARS; Marilene Wang, MD, FARS*

1:15 pm - 1:22 pm

**EPX as a biomarker for tissue eosinophilia in chronic rhinosinusitis regardless of polyp status**

Devyani Lal, MD, FARS

Beau Idler, BA

Tripti Brar, MD

Koji Iijima, Dr.

Sergei Ochkur, Dr.

Elizabeth Jacobsen, Dr.

Hirohito Kita, Dr.

**Background:**

Biomarker-directed personalized therapeutics in chronic rhinosinusitis (CRS) has become critical as newer biologic therapies become available. We investigated eosinophil peroxidase (EPX) as a biomarker for evaluation of tissue eosinophilia associated Type 2 cytokines

and chemokines.

**Methods:**

Patients undergoing sinonasal surgery were prospectively enrolled. Ethmoid tissue was analyzed with a 48-plex cytokine-chemokine array and EPX immunoassay. Subjects were grouped as follows: controls, polyp status (CRS with [CRSwNP] and without nasal polyps [CRSsNP]), tissue eosinophilia (eosinophilic CRS [eCRS], non-eosinophilic CRS [neCRS]), or their combinations (eCRSwNP, eCRSsNP, neCRSsNP). eCRS was defined as >10 eosinophils per high power field (HPF). Subjects without CRS or asthma were enrolled as controls.

**Results:**

Twenty-eight subjects were enrolled. EPX and IL-5 were elevated in CRSwNP tissue over control ( $p=0.007$ ,  $p=0.027$ , respectively) but not over CRSsNP. eCRS had elevated EPX and IL-5 over neCRS ( $p=0.002$ ,  $p<0.001$ , respectively). eCRSwNP and eCRSsNP displayed elevation of EPX over neCRSsNP ( $p=0.01$ ,  $p=0.007$ , respectively). IL-5 was elevated in eCRSwNP ( $p=0.019$ ) over neCRSsNP, though not over eCRSsNP. Area under the receiver operator characteristic curve (AUC) was 0.938 (95% CI, 0.835-1.00) for EPX and tissue eosinophilia, with an optimal cut-point of 470 ng/mL being 100% specific and 81.25% sensitive for >10 eosinophils per HPF. Linear regression revealed a strong correlation between EPX and IL-5 ( $R=0.811$ ,  $R^2=0.657$ ).

**Conclusions:**

EPX serves as a strong biomarker of tissue eosinophilia in CRS patients regardless of polyp status. EPX correlates with IL-5 and may be suitable as a biomarker for anti-IL-5 therapies.

1:23 pm - 1:30 pm

**Re-Open-1: A randomized double-blind placebo-controlled trial of EDS-FLU for CRSwNP or CRSsNP**

James Palmer, MD, FARS

University of Pennsylvania

**Background:**

There are no FDA-approved treatments for chronic rhinosinusitis without nasal polyps (CRSsNP). EDS-FLU uses the exhalation delivery system to deliver fluticasone propionate to superior/posterior regions of the nasal cavity. Re-Open-1 is the first of two clinical trials conducted with the intent of regulatory approval for CRSsNP.

**Methods:**

Re-Open-1 was a 24-week, randomized, double-blind, placebo-controlled, parallel-group trial to evaluate the efficacy and safety of EDS-FLU 186 $\mu$ g and 372 $\mu$ g twice daily versus EDS-placebo in patients with CRS. Co-primary endpoints were composite score of nasal symptoms (CSNS) at week 4 and average percent of opacified volume (APOV) in the ethmoid/maxillary sinuses measured

## PROGRAM ABSTRACTS

by CT at week 24. Secondary endpoints included 22-item sinonasal outcomes test (SNOT-22) score at week 4.4

## Results:

Baseline characteristics were similar across treatment arms: overall N=327; mean CSNS=5.56; APOV=68.9; SNOT-22=49.9; n=205 (60%) with NP. EDS-FLU 186µg (n=110) and 372µg (n=107) improved both co-primary endpoints versus EDS-placebo (n=110): CSNS least-square (LS) mean change, EDS-placebo, -0.62; EDS-FLU 186µg, -1.58; EDS-FLU 372µg, -1.60, (p<.001); APOV LS mean change -1.60, -5.58, -6.20 (p<.001), respectively. SNOT-22 LS mean changes were: EDS-placebo, -10.16; EDS-FLU 186µg, -18.05 (p=.001); EDS-FLU 372µg, -22.77 (p<.001). Adverse events (≥3% of patients and more common with EDS-FLU than EDS-placebo) were epistaxis, nasopharyngitis, asthma, and cataracts.

## Conclusions:

Re-Open-1 is the first phase 3 trial to demonstrate significant improvement in sinus opacification with a nasal treatment and improvement in both symptoms and an objective measure of disease in a population that included CRSsNP and CRSwNP.

1:31 pm - 1:38 pm

**Randomized controlled trial of the effect of TXA on epistaxis following sinonasal surgery**

Ashoke Khanwalkar, MD  
Zara Patel, MD, FARS  
Jayakar Nayak, MD  
Peter Hwang, MD, FARS  
Erik Chan, Clinical Research Coordinator  
Pooya Roozdar, Visiting Scholar  
Dayoung Kim, Research Assistant  
Yifei Ma  
University of Colorado

## Introduction:

Postoperative epistaxis is a known possibility following endoscopic sinus and nasal surgery. Tranexamic acid (TXA) is an antifibrinolytic agent which has been shown to reduce intraoperative blood loss and improve the visual field during these procedures. This study evaluates the clinical efficacy of TXA when given at end of surgery to reduce postoperative bleeding as well as the need for additional interventions to control epistaxis.

## Methods:

This randomized, double-blinded placebo-controlled trial was conducted from April to November 2021. Patients scheduled to undergo endoscopic sinus or nasal surgery were randomized to receive an intravenous dose of 1g TXA or saline intraoperatively 15 minutes prior to extubation. A VAS was used to query patients regarding postoperative bleeding each day for one week following surgery. The medical record was examined to determine the need for additional evaluations or interventions for epistaxis.

## Results:

40 patients completed the study. The postoperative bleeding VAS for the TXA group on the day of surgery was not significantly different from the saline group (4.82 vs 5.03, p=0.8). There were no significant differences between treatment arms on any postoperative day through day 7 (0.67 vs 0.87, p=0.7), nor in the reduction in VAS compared to the respective baseline on the day of surgery. There were no significant differences in need for additional interventions (e.g. additional evaluation in recovery, ED, or clinic, need for packing, or return to OR).

## Conclusion:

While TXA has previously demonstrated efficacy to reduce bleeding during endoscopic sinus and nasal surgery, when postoperative bleeding is already minimal at baseline, TXA does not appear to reduce it further.

1:39 pm - 1:46 pm

**Chitogel post-ESS promotes healthy microbiome and reduces post-operative infections**

Anna Megow  
Yazeed Alsuliman, Dr  
George Bouras, Mr.  
Martha Menberu, Dr  
Erich Vyskocil, Dr.  
Sarah Vreugde, Associate Professor  
Peter-John Wormald, Professor  
University of Adelaide, South Australia, Australia

## Background:

Post-operative infections following endoscopic sinus surgery (ESS) impairs wound healing and leads to poor outcomes. The aim of this study is to assess the effectiveness of Chitogel® to reduce infections and restore a healthy microbiome following ESS.

## Methods:

In this double-blinded randomised control trial, 25 patients undergoing ESS were prospectively recruited. At the end of surgery, patients were randomised to receive Chitogel to one side of the sinuses (allowing the other side to serve as control). Patients underwent routine follow-up with nasoendoscopies performed at 2-, 6- and 12-weeks post-operative. Sinus ostial measurements, microbiology and microbiome swabs from both sides were collected intraoperatively and at 12 weeks post-operative. Additional swabs were collected if infection was present.

## Results:

Improved endoscopic appearance of the sinuses (p=0.03) and ostial patency were noted on the Chitogel side compared to control at 12 weeks (p<0.001). A significant decrease in infections on the Chitogel side 12.0% compared to control 52.0% (p=0.005) was evident. Following use of Chitogel, there was a significant increase in the combined relative abundance of commensals *Corynebacterium* and *Cutibacterium* (*Propionibacterium*) from 30.15% at baseline to 46.62%



## PROGRAM ABSTRACTS

at 12 weeks compared to control (47.18% to 40.79%) (p.adj=0.01).

**Conclusion:**

Chitogel significantly improved both the nasoendoscopic appearance of the sinuses and sinus ostial patency at 12 weeks post-operative. Chitogel used following ESS significantly increased the proportion of commensals *Corynebacterium* and *Cutibacterium* (*Propionibacterium*), promoting a healthier microbiome and resulting in a significant decrease in post-operative infections.

1:47 pm - 1:54 pm

**Platelet-rich plasma for COVID-19 smell loss, a randomized controlled trial**

Carol Yan, MD

Sophie Jang

Charlie Lin

Ashoke Khanwalkar, MD

Anthony Thai

Zara Patel, MD, FARS

University of California San Diego School of Medicine

**Introduction:**

This study evaluated the use of platelet-rich plasma (PRP), an autologous blood product with supraphysiologic concentrations of growth factors, in the treatment of prolonged COVID-19 related smell loss.

**Methods:**

This multi-institutional, randomized controlled trial recruited COVID-19 patients with objectively measured smell loss (UPSIT $\leq$ 34) between 6-12 months despite prior use of standard therapy. Subjects were randomized to receive 3 intranasal injections of either PRP or sterile saline into their olfactory clefts. Olfactory function was measured objectively and subjectively using Sniffin' Sticks (SS) and visual analogue scale at baseline, 1- and 3-months post-treatment.

**Results:**

31 subjects were recruited and 24 completed the study (4 were normosmic by first treatment visit and 3 were otherwise disqualified). At 3-mo post-treatment, 6 of 13 (46.2%) PRP subjects achieved a clinically significant improvement in smell function ( $\geq$ 5.5pts SS) compared to 1 of 11 (9.1%) placebo subjects (odds ratio 8.57, 95% confidence interval 0.84-87.8, p=0.078). Compared to placebo, there was a greater mean improvement in the PRP arm at 1-mo (+3.8 vs. +1.5pts, p=0.25) and 3-mo (+4.8 vs. +3.2pts, p=0.49), but this was not statistically significant. The greatest improvement was noted in smell discrimination (PRP +2.3 vs saline +0.7, p=0.07). Outcomes were independent of baseline score, duration of loss, age, or parosmia status. No adverse effects were reported.

**Conclusion:**

Olfactory function following COVID-19 can improve spontaneously after 6 months. This data also builds on

the promise of PRP to be a potential, safe treatment option for patients with COVID-19 smell loss, but larger-powered studies will help assess true efficacy.

1:55 pm - 2:05 pm

**Q&A**

2:05 pm 2:15 pm

**Awards Ceremony**

Jean Kim, MD, FARS; Jivianne Lee, MD, FARS

2:15 pm - 3:00 pm

**David W. Kennedy Lecture**

"Improving outcomes from sinonasal surgery – What are we missing?"

Introduction: Sarah Wise, MD, FARS

Guest Speaker: Professor Claire Hopkins, BMBCH, FRCS (ORLHNS)

3:00 pm - 3:30 pm

**Break with Exhibitors in Franklin Hall**

**Top Rated Abstracts – Basic and Translational Science**

*Moderators: Naweed Chowdhury, MD; Kara Detwiller, MD, FARS; Nyall London, MD, FARS*

3:30 pm - 3:37 pm

**Epigenetics in chronic rhinosinusitis vs. controls**

Tripti Brar, MBBS, MD

Hirohito Kita, Dr.

Devyani Lal, MD, FARS

Mayo Clinic, Arizona

**Background:**

Epigenomics studies heritable changes induced in the host DNA as a result of environmental exposures. Epigenetic studies may reveal critical insights into host-environment interactions in chronic rhinosinusitis (CRS) pathogenesis. However, such studies are lacking outside of Asia. This study investigates epigenetic changes in CRS subjects in the United States.

**Methods:**

CRS and non-CRS adult patients were prospectively enrolled at a tertiary Rhinology clinic. Ethmoidal and control inferior turbinate tissue were sampled for epigenetic study by the Reduced Representation Bisulfite Sequencing (RRBS) methodology. The RADmeth® bio-statistical package was used to identify differentially methylated regions (DMR) between CRS and controls. Differences in promoter sites of genes was studied by testing 3,357,456 CpG sites. Pathway analysis of these DMRs was performed.

**Results:**

Ninety-three subjects were accrued. These included 64 CRS (36 CRSwNP; 28 CRSsNP) and 29 controls. Between CRS and controls, 13,662 CpGs were found

## PROGRAM ABSTRACTS

to be significantly different. Additionally, 1,382 DMR regions were also significantly different. Top upstream regulators that significantly differed between CRS vs. control were TGFB1, TNF, TP53, DGCR8 and beta-estradiol. TGFB1, CTNNB1, lipopolysaccharide, ID2 and TCF7L2 were different in CRSwNP vs. controls.

#### Conclusion:

When compared to controls, CRS tissue exhibited significantly different DNA methylation patterns. Epigenetic changes accounting for significant differences in the TGF beta 1 and TNF pathways between CRS and controls were identified. In addition, other differentially expressed pathways that have not yet been investigated were also identified. These findings warrant further investigation.

3:38 pm - 3:45 pm

#### **CST1 is an upstream initiator of epithelial derived type 2 inflammation in a murine model**

Alan Workman, MD  
Angela Nocera, MS  
Mansoor Amiji, PhD  
Benjamin Bleier, MD, FARS  
Harvard Medical School

#### Background:

CST1, a cysteine protease inhibitor, has been shown to promote type 2 inflammation and is significantly overexpressed in CRSwNP. The purpose of this study was to develop a murine model that recapitulates the hallmarks of type 2 CRS through chronic exposure to CST1.

#### Methods:

C57/BL6 were dosed with 3.9 µg/mL CST1 or PBS intranasally for 5, 10 and 18 days. Inflammatory cytokines were quantified after sacrifice using Quansys multiplex assays or ELISAs. Flow cytometry was used to determine mucosal infiltration of inflammatory/immune cell populations. These quantitative measures were complemented with histology and MRI of the sinuses.

#### Results:

Cytokine secretion occurred in a time dependent manner with increased type 2 inflammatory cytokines after 18 days. CST1 exposure at day 18 preferentially increased the production of type 2 cytokines [IL-4(130.1%, p=0.012), IL-5(155.1%, p=0.0093) and IL-13(138%, p= 0.0145)] as well as Eotaxin (171.2, p=0.045) and P-glycoprotein (182.1%, p=0.0035, n=4 for all) when compared to baseline. The treated mice demonstrated increased Th2 cell infiltration relative to control (1.77%CD4+ vs. 0.19%CD4+; respectively) but not Th1 cells as quantified by flow cytometry.

#### Conclusion:

CST1 is a potent upstream epithelial initiator of type 2 inflammation. This model thereby provides a novel tool with which to study the pathophysiology of type 2 CRS in vivo.

3:46 pm - 3:53 pm

#### **Impact of ambient PM2.5 on differentiated human nasal epithelial cell function and viability**

Juliana Theorell, MD/PhD candidate  
Natalia Obacz  
Minxiu Wang, PhD  
Victoria Lee, MD  
Omar Perez, PharmD, PhD

#### Introduction:

Air pollution, is the world's largest single environmental health risk, with lower income areas being disproportionately affected. Particulate matter ≤2.5 µm in diameter (PM2.5) is a major indoor and outdoor air pollutant. There is increasing evidence for the role of air pollution in initiating or exacerbating factors in sinonasal inflammatory diseases such as chronic rhinosinusitis. This study investigated the impact of ambient PM2.5 on differentiated human nasal epithelial cell (HNEC) viability and mucosal barrier function.

#### Methods:

Ambient PM2.5 was collected from Chicago and characterized. A broad range of PM2.5 concentrations (0 µg/mL-500 µg/mL) was then added on HNEC for 24 hours. Mucosal barrier function was assessed through trans-epithelial electrical resistance (TEER), permeability of fluorescein isothiocyanate (FITC) 4kDa, and immunofluorescent staining of tight junction protein ZO-1. Cytotoxicity was assessed through lactate dehydrogenase assay.

#### Results:

Compared to control medium, increasing ambient PM2.5 concentrations significantly decreased TEER, increased FITC permeability, and decreased ZO-1 protein expression in HNECs, suggesting negative effects on mucosal barrier function. Compared to control medium, increasing ambient PM2.5 concentrations also increased cytotoxicity in HNECs.

#### Conclusions:

These in vitro results demonstrate the detrimental dose-dependent effects of ambient PM2.5 on HNEC mucosal barrier function and viability. Understanding the impact of air pollution on the upper airway can potentially inform the increased prevalence of certain diseases in high-pollution areas and identify therapeutic and public health interventions to mitigate the harmful effects of PM2.5.

3:54 pm - 4:01 pm

#### **Hypoxia-induced CFTR dysfunction is a mechanism underlying reduced mucociliary transport in CRS**

Do-Yeon Cho, MD  
Shaoyan Zhang, PhD  
Daniel Skinner, BS  
Dong Jin Lim, PhD  
Jessica Grayson, MD  
Sadis Matalon, MD  
Ahmed Lazrak, PhD  
Steven Rowe, MD

## PROGRAM ABSTRACTS

Bradford Woodworth, MD, FARS  
University of Alabama at Birmingham

**Introduction:**

Hypoxia due to sinus obstruction is considered a major pathogenic mechanism leading to the development of sinusitis. We previously identified that hypoxia induces an acquired CFTR defect in sinonasal epithelial cells in vitro with corresponding mucociliary dysfunction (MCD). The objective of the current study is to define the electrophysiologic characteristics of induced hypoxia in vitro and within a rabbit model in vivo.

**Methods:**

CF bronchoepithelial cells expressing wild-type CFTR were exposed to 1% or atmospheric O<sub>2</sub> for 24 hours. CFTR currents were recorded in whole-cell mode of the patch-clamp technique. A rabbit model of hypoxic maxillary sinusitis was created by blocking the middle meatus for 14 days. We harvested tissue for gene expression of hypoxia-inducible factor-1 alpha (Hif1 $\alpha$ , indirect hypoxia marker), and pH recordings of the airway surface liquid. Rabbits underwent sinus potential difference (SPD) assay to determine transepithelial Cl<sup>-</sup> transport across the epithelium.

**Results:**

Whole-cell patch-clamp showed near complete inhibition of activated Cl<sup>-</sup> currents of cells after 24-hour hypoxia incubation (n=6; 80 mV holding potential; 198.8 $\pm$ 106.8 vs. 931.1 $\pm$ 250.4 pA). Rabbit sinus mucosa exhibited significantly increased Hif1 $\alpha$  relative mRNA in sinusitis rabbits (n=5; 616.1 $\pm$ 83.5 vs. 382.5 $\pm$ 50.0, p<0.05) and the mucosal surface showed significantly reduced pH (n $\geq$ 13, 7.12 $\pm$ 0.05 vs. 7.34 $\pm$ 0.05; p<0.01). SPD measurements demonstrated markedly diminished transepithelial Cl<sup>-</sup> transport (-4.2 $\pm$ 1.0 vs. -19.5 $\pm$ 1.3 mV).

**Conclusion:**

Hypoxia induces severe CFTR dysfunction according to patch-clamp technique in vitro and NPD in vivo. Improved oxygenation is critical to reducing the impact on persistent MCD.

4:02 pm - 4:09 pm

**CRS related S. aureus strains demonstrate enhanced pathogenicity**

Simon Goldie, MRCS, DOHNS, MBChB  
Phillip Harries, Mr.  
Huw Jones  
Andrew Walls, Dr.  
Salib Rami, Prof.

**Objectives:**

There is growing evidence to implicate staphylococcus aureus (*S. aureus*) in the pathogenesis of chronic rhinosinusitis (CRS). *S. aureus* colonises the nasal cavity in 60% of patients with CRS vs 32.4% of the general population. Published work in our group has shown *S. aureus* ability to internalise within mast cells in nasal

polyps. We set out to determine if there are differences in pathogenicity between CRS-related *S. aureus* strains in mast cell co-cultures compared to non-infected controls.

**Methodology:**

*S. aureus* strains isolated from a non-infected control and a CRS patient were co-cultured with LAD2 immortalised mast cells to determine intracellular and extracellular survival of bacteria using colony forming unit enumerations, live/dead confocal imaging and Giemsa staining at 3,6, 9 and 24 hours.

**Results:**

Viable *S. aureus* from both CRSwNP and non-infected controls internalised and replicated within LAD2 mast cells. CRSwNP specific *S. aureus* was shown to have increased intracellular survival and increased extracellular survival when compared with the non-infected control strain.

**Conclusions:**

CRS-related *S. aureus* demonstrates increased virulence when compared to *S. aureus* from non-infected controls. This may manifest clinically with disease resistance and refractoriness to antibiotics.

4:10 pm - 4:20

**Q&A**

4:20 pm - 5:00 pm

**Panel: Artificial intelligence and deep machine learning in rhinology**

Moderator: Zara Patel, MD, FARS  
Panelists: David Gudis, MD, FARS; Michael Marino, MD, FARS; Edward McCoul, MD, FARS

5:15 pm - 7:00 pm

**President's Reception**

Liberty Ballroom

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**Saturday, September 10, 2022****8:00 am – 2:45 pm****Breakout A****Salon H/I/J**

7:00 am - 8:00 am

**Breakfast Symposia**

7:00 am – 8:00 am

**Meet the Authors Poster Viewing & Breakfast**  
Franklin Hall**Skull Base & Orbital Surgery Section Session**

8:00 am – 8:30 am

**Panel: Nuances of orbital decompression**Moderator: Mindy Rabinowitz, MD, FARS  
Panelists: Benjamin Bleier, MD, FARS; Judd Fastenberg, MD; Kibwei McKinney, MD; Michael Rabinowitz, MD**Panel: Skull base malignancy – case discussion with the experts**Moderator: Garret Choby, MD, FARS  
Panelists: Mathew Geltzeiler, MD, FARS; Richard Harvey, MD, FARS; Devyani Lal, MD, FARS; James Palmer, MD, FARS**Endoscopic Endonasal Sella and Skull Base Surgery***Moderators: Emily Barrow, MD; Corinna Levine, MD, FARS; Mathew Geltzeiler, MD, FARS*

9:15 am - 9:21 am

**Postoperative management following endoscopic skull base reconstruction**Khodayar Goshtasbi, MD MS  
Peter Papagiannopoulos, MD  
Bobby Tajudeen, MD, FARS  
Elisabeth Ference, MD, MPH, FARS  
Bozena Wrobel, MD, FARS  
Eric Wang, MD, FARS  
James N. Palmer, MD, FARS  
Nithin Adappa, MD, FARS  
Edward Kuan, MD, FARS  
University of California Irvine School of Medicine**Objective:**

There is no consensus for management protocols following endoscopic skull base surgery. This study aims to provide a cross-sectional overview of skull base surgeons' practice patterns for postoperative management following endoscopic skull base reconstruction.

**Methods:**

An online-based survey focusing on various practice

patterns related to skull base reconstruction was anonymously distributed to the American Rhinologic Society and North American Skull Base Society membership.

**Results:**A total of 130 surgeons (97 otolaryngologists and 33 neurosurgeons) completed the survey, the majority of whom worked in an academic setting (81.5%) and repaired at least 15 CSF leaks and skull base defects every year (73.8%). Regarding reconstructive materials, 36.9% always used autologous as opposed to synthetic materials, with variation in specific materials used. Lumbar drain was never used by 22.3% of respondents, while high BMI or suspected intracranial hypertension (43.1%) and high-flow leak or large dural defects (50.0%) were indications for lumbar drain usage. Of the 77.7% of participants who used dural sealant over the skull base repair, Duraseal® (40.8%) and fibrin glue (36.9%) were the most commonly used materials. There was significant variation in types of nasal packing used, type and duration of postoperative activity restrictions, and debridement protocols. Postoperative antibiotics was given by 87.7% of respondents and 59.8% of times for  $\geq 3$  days.**Conclusion:**

Postoperative management following endoscopic skull base reconstruction is highly complex and there exist a wide variety of practice patterns. Further research of higher quality evidence is warranted to identify optimal management patterns.

9:22 am - 9:28 am

**Endocrinopathy risk factors after transsphenoidal surgery**Jake Lee, MD, MSCI  
Brian Deutsch, Resident Physician  
John Schneider, MD  
Patrik Pipkorn, Assistant Professor  
Lauren Roland, MD  
Washington University School of Medicine**Background:**

Endocrinopathies, such as diabetes insipidus (DI), adrenal insufficiency (AI), syndrome of inappropriate antidiuretic hormone secretion (SIADH), and hypopituitarism, are morbid complications of endoscopic transsphenoidal surgery (TSS). Demographic, comorbidity, operative, and histologic risk factors are sparse and inconsistently reported in the literature.

**Methods:**

A retrospective cohort study of consecutive patients who underwent TSS between January 2015 and January 2020 was performed. Only those with Endocrinology follow-up of at least 6 months were included.

**Results:**

Of 223 patients (mean 53.5 [14.9] years, 126 [57%] female), 25 (11%), 52 (23%), and 32 (14%) patients



## PROGRAM ABSTRACTS

developed postoperative permanent DI, permanent AI, and delayed hyponatremia consistent with SIADH, respectively. On multivariable analysis, DI was strongly associated with smoking (aRR 2.91, 95% CI 1.39-6.85), intraoperative cerebrospinal fluid (CSF) leak (aRR 2.41, 95% CI 1.15-5.07), and non-adenoma pathology (aRR 2.38, 95% CI 1.11-5.13). AI was strongly associated with tumor size >4 cm (aRR 2.70, 95% CI 1.57-4.67), revision TSS (aRR 1.81, 95% CI 1.07-3.05), and fat graft (aRR 2.44, 95% CI 1.37-4.34) while it was not significantly associated with intraoperative CSF leak (aRR 1.29, 95% CI 0.76-2.17), subtotal resection (aRR 1.23, 95% CI 0.75-2.03), and non-adenoma pathology (aRR 1.24, 95% CI 0.69-2.21) on multivariable analysis. SIADH was significantly associated with age (aRR 1.03, 95% CI 1.00-1.05) and TSH-secreting adenoma (aRR 1.96, 95% CI 0.82-4.68).

#### Conclusions:

Certain demographic, morphologic, operative, and histologic risk factors may be strong risk factors for post-TSS endocrinopathies and hypopituitarism, such as DI, AI, and SIADH.

9:29 am - 9:35 am

#### **Outcomes after clinical care pathway implementation for EEA approach for sellar pathologies**

Aamr Hasanjee, Medical Student  
Edward El Rassi, MD

#### Background:

Endoscopic endonasal approach (EEA) for surgical management of sellar pathologies has been widely adopted and shown to improve surgical outcomes and patient reported outcome measures while also decreasing complication rates. To improve outcomes and resource utilization while streamlining care for complex case, skull-based teams and clinical care pathways (CCP) have been implemented nationwide. This study aims to determine the impact of CCP implementation for patients undergoing EEA for sellar lesions at a tertiary referral center.

#### Methods:

This study was a retrospective analysis of 110 patients prior to CCP implementation and 62 patients following CCP implementation for an EEA for sellar lesions at a tertiary medical center from 2018-2020. Patient demographics, procedure time, CSF leak rate, reconstructive methods, material usage, length of stay, infection rate, and other perioperative and rhinologic outcomes were recorded.

#### Results:

Demographic data demonstrated statistically similar incidence of sellar pathologies as well as tumor size, functional status, and previous treatments. Following implementation of the CCP, outcomes improved as procedure time decreased by 121 minutes and nasoseptal flap use decreased by 35% while intra-operative CSF leak rate remained similar. Hospital length of stay was reduced by 2.5 days, ICU length of stay reduced by 1.3

days, complication rate decreased by 16%, and antibiotic use reduced by 41%. A 17% reduction in prolonged post-operative crusting with necessary debridements was observed.

#### Conclusion:

Implementation of a CCP by a skull-based team significantly improved perioperative and rhinologic outcomes for patients undergoing an EEA for pituitary adenomas and sellar pathologies.

9:36 am - 9:42 am

#### **Frailty does not impact postoperative outcomes in extended endonasal skull base surgery**

Rijul Kshirsagar, MD  
Jacob G. Eide, MD  
Anas Qatanani  
Jacob Harris  
Eric Abello  
Kelsey Roman  
Milind Vasudev  
Edward Kuan, MD, FARS  
James N. Palmer, MD, FARS  
Nithin Adappa, MD, FARS  
University of Pennsylvania

#### Introduction:

Frailty metrics estimate a patient's ability to tolerate physiologic stress and, to date, there are limited frailty data in patients undergoing extended endonasal approach (EEA) surgery for suprasellar pathologies despite increases in utilization of this approach.

#### Methods:

Cases of patients undergoing EEA for suprasellar pathologies at two tertiary medical centers were retrospectively reviewed. Demographic, treatment, survival and post-operative outcomes data were recorded. Frailty was calculated using validated indexes, including the American Society of Anesthesiologists (ASA) classification, modified 5-item frailty index (mFI-5), and the Charlson Comorbidity Index (CCI). Outcomes included medical and surgical complications, readmission, length of stay (LOS), and mortality.

#### Results:

88 patients were included, with 59 (67%) female patients and mean age  $54 \pm 15$  years. Most common pathologies included 53 meningiomas (60.2%), and 21 craniopharyngiomas (23.9%). All patients had an intra-operative cerebrospinal fluid (CSF) leak and 12 patients (13.6%) developed a post-operative CSF leak. Most patients were ASA class 3 (54.5%) with mean mFI-5  $0.82 \pm 1.01$  and CCI  $4.18 \pm 2.42$ . There was no association between increased frailty and 30-day medical or surgical outcomes (including postoperative CSF leak), readmission, or mortality ( $p > 0.05$ ). Higher mFI-5 was predictive of increased LOS greater than the median of 4 days (OR: 2.87, 95% CI: 1.37-6.75,  $p = 0.008$ ), although CCI ( $p = 0.6$ ) and ASA classification were not ( $p > 0.9$ ).

#### Conclusions:

## PROGRAM ABSTRACTS

Despite a significantly frail patient population, we found no association with worsening treatment outcomes, suggesting that traditional frailty metrics may not correlate with EEA outcomes.

9:43 am - 10:00 am

### Q&A

10:00 am - 10:30 am

### Break with Exhibitors in Franklin Hall

## Sinonasal Tumors and Orbital Surgery

*Moderators: Anthony Del Signore, MD; Patricia Loftus, MD, FARS; Nicholas Rowan, MD*

10:30 am - 10:36 am

### Effect of sarcopenia on survival outcomes in patients with nasopharyngeal and sinonasal cancer

Peter Kim, MD

Jess Mace, MPH,

Nicole Santucci

Rula Mualla

Matthew Hill

Hailey Pfeifer

Brennan Olson

Timothy Smith, MD, FARS

Daniel Clayburgh

Mathew Geltzeiler, MD, FARS

Oregon Health and Science University

#### Background:

Sarcopenia, defined as low skeletal muscle mass, is an established, negative prognostic factor for various malignancies. Associations between sarcopenia and treatment outcomes has yet to be described for patients with sinonasal squamous cell carcinoma (SN/SCC) and nasopharyngeal carcinoma (NPC).

#### Methods:

A retrospective review was conducted for patients with SN/SCC and NPC, treated from January 2000-June 2018 within a single, academic institution. Sarcopenia was assessed, via computed tomography, by measuring C-3 and sternocleidomastoid paraspinal muscle mass. Primary outcomes included 24- and 60-month overall survival (OS) and disease-free survival.

#### Results:

Sarcopenia was prevalent in 38/104 (36.5%) of all cases. For patients with NPC, OS was similar at 24-months between those with and without sarcopenia (72.7%[SE±13.4] vs. 71.6%[±9.8],  $p=0.95$ ) compared to worse OS for patients with sarcopenia at 60-months (48.0%[±16.4] vs 63.7%[±11.9],  $p=0.45$ ). For patients with SN/SCC, OS was worse for patients with sarcopenia at both 24-month (60.0%[±12.6] vs. 77.8%[±9.8];  $p=0.18$ ) and 60-month (44.0%[±14.3] vs. 75.2%[±12.6];  $p=0.08$ ), compared to patients without. While not statistically significant at conventional thresholds

( $\alpha$ -level=0.05), effect size at 60-month OS (~31%) was comparable to existing literature for SCC within other subsites.

#### Conclusions:

Sarcopenia may represent a negative prognosticator for OS in SN/SCC and NPC. This pilot study identified similar OS effect size differences associated with sarcopenic patients with SN/SCC (~31%) and NPC (~15%) when compared to SCC from other subsites and NPC-endemic regions. This study will direct future investigation into the role sarcopenia in SN/SCC and NPC.

10:37 am - 10:43 am

### A multi-institutional survey of sinonasal lymphoma outcomes over the past 20 years

Jacob Eide, MD

Rijul S. Kshirsagar

Jack Birkenbeuel

Eric H. Abello, MD

Sara Hobday

Sabrina Herzberg

Beverly Wang

James N. Palmer, MD, FARS

Nithin Adappa, MD

Edward Kuan, MD, FARS

#### Background:

Sinonasal lymphoma (SL) is a heterogenous disorder with limited outcomes data. We sought to better define treatment outcomes by subtype and treatment at two tertiary referral centers over the last two decades.

#### Methods:

Patient demographics, clinicopathologic data, and treatment outcomes for patients treated for SL were queried from January 1, 2000 to December 31, 2021 at two tertiary academic medical centers.

#### Results:

84 patients were included, with an average age at diagnosis of 63.4 +/- 15 years. There were 34 females (40.5%). The majority of patients had an ECOG score < 2 (76.2%) and the most common presenting symptom was facial swelling/pain (26.2%). The most common primary site was the nasal cavity (36.9%). Diffuse large B-cell lymphoma was the most common subtype (46.4%), followed by extranodal NK/T cell lymphoma (17.9%). Chemotherapy was the most common treatment strategy (n=59, 70.2%), followed by radiation therapy (n=35, 41.7%) and underwent immunotherapy (n=24, 28.6%). Disease-specific survival (DSS) at 1, 5, and 10 years were 85.7%, 73.6%, and 58.6%, respectively, and 18 (21.4%) developed recurrence. On multivariate analysis, higher ECOG score ( $p<0.0001$ ) and history of head and neck radiation ( $p=0.048$ ) were associated with worse survival. Younger age was associated with greater risk of recurrence ( $p=0.022$ ) and male sex was associated with more treatment side effects ( $p=0.012$ ).

## PROGRAM ABSTRACTS

## Conclusions:

This is the largest multi-institutional analysis of SL and suggests that, while disease control in the first 5 years is reasonable, 10-year outcomes remains challenging. Future studies investigating new treatment paradigms and risk stratification are needed.

10:44 am - 10:50 am

**Volume and survival in endoscopic surgery for sinonasal squamous cell carcinoma**

Benjamin Bitner, MD  
Sina Torabi  
Eric Abello  
Theodore V. Nguyen  
Khodayar Goshtasbi  
Edward Kuan, MD, FARS  
UCI

## Objective:

Sinonasal malignancies are a rare entity, of which sinonasal squamous cell carcinoma (SNSCC) is the most common subtype. Facility volume as a predictor of survival in patients treated with an endoscopic approach has yet to be described. The purpose of this study is to analyze the influence of facility volume on OS in patients with SNSCC surgically treated endoscopically.

## Methods:

The 2010-2016 National Cancer Database was used to isolate all endoscopic surgical cases of sinonasal squamous cell carcinoma. Facility volume was calculated, and patients were separated into those treated at low volume centers (LVCs; 1-2 cases total; 0-75th percentile) vs high volume centers (HVCs' 5+ cases total; >90th percentile). Survival differences were calculated via a Kaplan-Meier analysis and a multivariate Cox regression.

## Results:

A total of 356 facilities performed 879 endoscopic SNSCC cases in this period, of which 39.6% were academic centers. However, high volume centers (n=44 centers) were largely academic ( $\geq 77.3\%$ ). After excluding missing patient data, 461 patients were identified, of which 179 were treated at LVCs and 193 at HVCs. Patients treated at HVCs were more likely to have private insurance (51.3% vs. 33.0%;  $p < 0.001$ ), advanced stage disease (46.2% vs. 31.3%;  $p = 0.002$ ), and maxillary sinus primary site (29.0% vs. 15.6%). Nevertheless, volume did not have an effect on overall survival on univariate analysis ( $p = 0.679$ ) or multivariate analysis (OR 0.83; 95% CI: 0.56-1.23;  $p = 0.361$ ).

## Conclusion:

Despite treating more advanced disease, high-volume centers were not associated with overall survival in patients with SNSCC who underwent endoscopic treatment.

10:51 am - 10:57 am

**Orbital resection by intranasal technique (ORBIT) staging system**

Aria Jafari, MD  
Benjamin Bleier, MD, FARS  
University of Washington

## Introduction:

The CHEER staging system has become the gold standard for outcomes reporting in endoscopic orbital surgery for orbital cavernous hemangioma (OCH). A recent systematic review demonstrated similar outcomes between OCHs and other primary benign orbital tumors suggesting a new and more comprehensive staging system, inclusive of all endoscopically treated primary orbital tumors, is necessary.

## Methods:

Patient, tumor characteristics, and operative outcomes from 11 international centers were recorded. All tumors were retrospectively assigned an ORBIT stage and stratified based on approach, either exclusively endoscopic or combined (endoscopic and open). Outcomes based on approach were compared using chi-squared or Fisher's exact tests. The Cochrane-Armitage test for trend was used to analyze outcomes by stage.

## Results:

Findings from 110 primary orbital tumors were included in the analysis. Higher ORBIT stage was associated with a lower likelihood of gross total resection (GTR). Tumors addressed using a combined approach tended to be larger, more likely to present with diplopia, and have immediate post-operative cranial nerve palsy ( $p < 0.05$ ). When an exclusively endoscopic approach was utilized, GTR was more likely to be achieved ( $p < 0.05$ ).

## Conclusion:

Endoscopic treatment of primary orbital tumors is a safe and effective approach, with favorable short and long term post-operative outcomes. The ORBIT Staging System is a simplified anatomic-based framework that effectively facilitates high-quality outcomes reporting for all primary orbital tumors.

10:58 am - 11:04 am

**Risk of frontal sinusitis after orbital decompression**

Parker Tumlin, MD  
Ian Sunyecz  
Norman Orabi  
Kareem Wasef, BS  
John Nguyen, MD  
Hassan Ramadan, MD, FARS  
Chadi Makary, MD, FARS

## Introduction:

Orbital decompression (OD) is performed to address proptosis and/or compressive optic neuropathy in thyroid eye disease (TED). Our goal is to study the risk factors associated with development of frontal sinusitis after OD.

## PROGRAM ABSTRACTS

## Methods:

Retrospective case-control study of all patients who underwent OD for TED from February 2010 to February 2021 was conducted. Demographic data and comorbidities were collected, and review of imaging was performed. The main outcomes of this study were identification of post-operative frontal sinusitis and associated risk factors. Frontal sinusitis was defined based on radiological evidence of mucosal opacification of the frontal sinus.

## Results:

109 cases of OD among 60 patients with TED were included. 38 cases of frontal sinusitis were identified. Median age was 52 y.o. (range 29-87 years) and 79% were female. Compared to controls, cases who developed frontal sinusitis had more complex frontal sinus anatomy [supra agger frontal cell (SAF): OR=6.7,  $p=0.0003$ , frontal septal cell (FS): OR=3,  $p=0.009$ , suprabullar frontal (SBF) cell: OR=3.2,  $p=0.03$ ], higher medial decompression (OR=14.5,  $p<0.0001$ ), more likely to have allergic rhinitis (OR=4.4,  $p=0.0007$ ), and more often underwent frontal sinusotomy at the time of OD (OR=3.7,  $p=0.008$ ).

Multivariate logistic regression showed that presence of SAF cell (OR 15.5,  $p = 0.006$ ), FS cell (OR 5.6,  $p = 0.02$ ), or high orbital decompression (OR 42.9,  $p<0.0001$ ) were the only significant risk factors for the development of frontal sinusitis post-operatively.

## Conclusion:

Complex frontal sinus anatomy and height of medial decompression are predisposing factors for development of frontal sinusitis after OD.

11:05 am - 11:15 am

**Q&A**

11:15 am - 12:00 pm

**Panel: Skull base reconstruction options beyond the naso-septal flap**

Moderator: Eric Wang, MD, FARS

Panelists: Emily Barrow, MD; Corinna Levine, MD, FARS; Katie Phillips, MD; Raj Sindwani, MD, FARS

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm – 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Program Luncheon**

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

**Biologics**

Moderators: Cecelia Damask, DO; Jose Mattos, MD; Lauren Roland, MD

1:00 pm - 1:06 pm

**Real world analysis of dupilumab for nasal polyposis not meeting proposed biologic use guidelines**

Isaac L. Schmale, MD

Alexander Poulakis, Medical Student

Audrey Abend, Medical Student

Li-Xing Man, MSc, MD, MPA, FARS

University of Rochester Medical Center

## Introduction:

Dupilumab has been increasingly incorporated into the management of chronic rhinosinusitis with nasal polypsis (CRSwNP). However, little data exists regarding dupilumab usage patterns and outcomes among patients not meeting proposed treatment algorithms for biologic initiation.

## Methods:

Patients prescribed dupilumab from any source for CRSwNP and had an electronic record at the University of Rochester Medical Center were identified. Those prescribed dupilumab for other indications were excluded. Patients with dupilumab initiation not conforming to proposed algorithms were analyzed.

## Results:

Of the identified 135 patients, 33 (24.4%) did not meet proposed criteria for biologic initiation. Reasons for not meeting criteria were: never had/offered sinus surgery (12.1%), never trialed appropriate corticosteroids (18.2%), residual surgical goals (9.1%), well controlled CRSwNP (18.2%), and wrong diagnosis/no polyposis (42.4%). Overall, dupilumab use not meeting criteria was more likely initiated by Allergy, Pulmonology, and non-Rhinology Otolaryngology compared to Rhinology (19, 9, 5, respectively versus 0;  $p < 0.00001$ ). Additionally, patients not meeting criteria had significantly less frequent assessment of treatment response 4 or more months after dupilumab initiation.

## Conclusions:

Dupilumab use in real world settings may not adhere to proposed nasal polyposis treatment algorithms. Patients not meeting proposed criteria had less contact with Rhinology and Otolaryngology than those meeting criteria, and non-Otolaryngology specialties were much more likely to start dupilumab prior to meeting criteria. This data may aid in future guidelines and improve shared decision-making for biologic initiation for nasal polyposis.



## PROGRAM ABSTRACTS

1:07 pm - 1:13 pm

**Dupilumab treatment delays in asthma and chronic rhinosinusitis with nasal polyps**

Samiat Awosanya, Research Fellow  
 Keisha Arielle Best, Research Fellow  
 Kathleen Gillmore, Student Researcher  
 Chandala Chitguppi, Research Fellow, Co-investigator  
 Jessica Most, Assistant Professor, Principal Investigator  
 Gurston Nyquist, MD, FARS, Co-investigator  
 Thomas Jefferson University Hospital

**Introduction:**

Dupilumab was recently approved for the treatment of chronic rhinosinusitis with nasal polyps (CRSwNP) and asthma. Delays to treatment remain overlooked in patient management. There is a paucity of literature on the frequency and risk factors associated with delays in treatment with dupilumab in this population. We aim to assess the frequency of delays, risk factors, and their impact on clinical outcomes in patients with asthma and CRSwNP.

**Methods :**

This is a retrospective cohort study of subjects for whom dupilumab was prescribed for the treatment of asthma and CRSwNP. The times for insurance approval via prior authorization (PA) and first biologic injection were reviewed. We compared clinical features and healthcare utilization during the window from prescription to biologic initiation.

**Results:**

Forty-four patients were identified; 61% were female (27/44), and the median age of biologic initiation was 57 years. Indication for dupilumab was 29.5% for asthma (13/44), 20.5% for CRSwNP (9/44), and 50% for both (22/44). Median biologic initiation time was 27.5 days (range: 4-357). Nearly all patients required PA (42/44, 95.5%). Subjects with a PA denial received first dupilumab injection at a mean of 72 days and experienced greater oral glucocorticoid use (60%) and acute healthcare utilization (20.9%) while awaiting biologic initiation compared to subjects with initial PA approval (45.5, 2.9%, respectively), who started biologics at a mean of 39 days.

**Conclusion:**

Delay in dupilumab treatment initiation is a risk factor for disease exacerbations, as seen in increased oral steroid exposure and acute healthcare utilization. The time between prescription and initiation should be expedited in this patient population.

1:14 pm - 1:20 pm

**Computational fluid dynamic analysis of improved olfaction after dupilumab**

Thomas Lepley, Medical Student  
 Zhenxing Wu, Dr  
 Bradley Otto, MD  
 Kathleen Kelly  
 Kai Zhao, Professor  
 The Ohio State University Department of Otolaryngology

**Background:**

Chronic Rhinosinusitis (CRS) is among the most common causes of olfactory loss, potentially mediated by inflammatory sensorineural loss or by conductive obstruction to the olfactory receptor sites. Dupilumab is a monoclonal antibody treatment for CRSwNP that often results in olfactory improvement, yet the mechanism by which it improves olfaction remains unclear.

**Objectives:**

To use CFD modeling to gain a better understanding of the mechanism by which Dupixent alleviates olfactory loss in patients with CRSwNP.

**Methods:**

3D computational Fluid Dynamic (CFD) modeling was constructed based on CT scans of one CRSwNP patient who did not symptomatically improve with surgery but did with dupilumab (SNOT22 pre-surgery: 84; post-surgery: 74; 11 months post- dupilumab: 24). Airflow patterns and velocity changes through the nasal airway were compared after sinus surgery and after administration of dupilumab.

**Results:**

CFD modeling demonstrated significant improvement in patency of the olfactory cleft with increased and greater distribution of airflow (from 0.4% to 26.4%, or 55.1 times increase) after administration of dupilumab compared to postoperatively. Interestingly, there was minimal change in nasal resistance between the two states (<1%). The improvement in olfactory airflow corresponded to significant improvement in smell identification score (from post-surgery: 16 to post-dupilumab: 35).

**Conclusion:**

Given the degree of improvement of smell identification, our report suggests that dupilumab may improve olfaction in patients with CRSwNP by reducing regional obstruction in the olfactory cleft, thereby increasing olfactory-relevant airflow specifically, as opposed to a reduction in overall nasal resistance.

## PROGRAM ABSTRACTS

1:21 pm - 1:27 pm

**Efficacy of dupilumab in allergic fungal rhinosinusitis**

Juan Carlos Hernaiz, Research fellow  
Bader Alim, MBBS, MD  
Athenea Rodriguez, Research coordinator  
Amin Javer, MD, FARS  
University of British Columbia

**Introduction:**

Dupilumab, a recently approved monoclonal antibody blocking IL-4 & 13, has shown efficacy in patients with chronic rhinosinusitis with nasal polyps (CRSwNP). However, there remains limited evidence regarding dupilumab's efficacy in patients with allergic fungal rhinosinusitis (AFRS).

**Methods:**

This retrospective case series analyzed 13 patients meeting the Bent and Kuhn criteria for AFRS who received dupilumab from October 2020 to March 2022. Total nasal polyp scores (NPS) and SNOT-22 scores were obtained from 1-3 months before starting dupilumab, and up to one year after initiation of treatment.

**Results:**

The median age was 55 years (range 28-78 years) and 4/13 (31%) were female. Twelve patients had never received a biologic medication before and one patient was switched from mepolizumab to dupilumab. At baseline, the median NPS and SNOT-22 scores were 2 (range 0-6) and 40 (range 14 – 64 points), respectively. Ten out of the thirteen patients completed at least eight months of follow-up and showed a median reduction in NPS of -2 points (range -0.5 to -6). Six of these ten patients improved one point or more in the total NPS. Nine out of ten patients improved more than nine points in their SNOT-22 scores after 8 months or more of follow-up (median change -20 points; range -1 to -62 points). Two patients reported mild and self-limited complaints (joint pain and conjunctivitis).

**Conclusions:**

Our preliminary results suggest that dupilumab is a safe and effective biologic therapy for AFRS patients. The reduction in NPS and SNOT-22 scores appears similar to that seen in patients with CRSwNP.

1:28 pm - 1:34 pm

**Impact of dupilumab on sinonasal outcomes in patients with AERD refractory to other biologics**

Glen D'Souza, MD  
Sean Parsel  
Rahul Alapati  
Kathleen Calaro  
Samiat Awosanya  
Aykut Unsal, MD  
Mindy Rabinowitz, MD, FARS  
Marc Rosen, MD, FARS  
Gurston Nyquist, MD, FARS  
Jessica Most, MD  
Elina Toskala, MD, FARS  
Thomas Jefferson University Hospital

**Background:**

Biologics are approved for the treatment of moderate-to-severe aspirin-exacerbated respiratory disease (AERD); Even though dupilumab, omalizumab, and mepolizumab have recently been approved for the treatment of chronic rhinosinusitis with nasal polyps, there is a paucity of evidence comparing their efficacy on sinonasal symptoms in patients with AERD.

**Objective:**

To analyze the effect of dupilumab in controlling sinonasal outcomes in patients with AERD whose symptoms were inadequately controlled by other biologics.

**Methods:**

Patients treated using biologics for AERD were retrospectively included if they required a change to dupilumab after trialing omalizumab, benralizumab, or mepolizumab. Sinonasal outcomes were measured using the 22-Item Sinonasal Outcome Test (SNOT-22) and Meltzer polyps scores before and after starting dupilumab.

**Results:**

There were 17 patients who met inclusion criteria for the study. The mean age of the cohort was 42.2 (SD±13.21) years, with the majority being female (58.8%) and black (58.8%). Endoscopic sinus surgery (ESS) was performed a median (IQR) of 1.5 (2) times while on alternative biologics. Prior to dupilumab therapy, 12 (70.6%) patients were on one other biologic agent, 4 (23.5%) had tried two agents, and 1 (5.9%) patient had been placed on three biologics. After switching to dupilumab, the median duration of treatment to evaluation was 525 (IQR-318) days. There was a significant reduction in SNOT-22 and nasal polyp from 46.8 to 23.2 (p<0.001) and 3.7 to 0.7 (p=0.002), respectively. No patients required endoscopic sinus surgery after switching to dupilumab.

**Conclusion:**

Dupilumab is effective in managing sinonasal symptoms in AERD patients refractory to other biologics.

## PROGRAM ABSTRACTS

1:35 pm - 1:45 pm

**Q&A**

1:45 pm - 2:00 pm

**HOT TOPICS: What's on the horizon? Biologics for nasal polyposis**

Speakers: Kent Lam, MD, FARS; Lauren Roland, MD

2:00 pm - 2:45 pm

**Panel: Unified airway update**

Moderator: Kevin Welch, MD, FARS

Panelists: John Bosso, MD; Cecelia Damask, DO; Claire Hopkins, MD; Anju Peters, MD

2:45 pm - 3:15 pm

**Break with Exhibitors in Franklin Hall****Saturday, September 10, 2022****8:00 am – 12:00 pm****Breakout B****Salon A/B**

7:00 am - 8:00 am

Breakfast Symposia

7:00 am – 8:00 am

Meet the Authors Poster Viewing & Breakfast  
Franklin Hall**Chronic Rhinosinusitis Histology and Treatment***Moderators: Angela Donaldson, MD, FARS; Elisabeth Ference, MD, FARS; Ashoke Khanwalkar, MD*

8:00 am - 8:06 am

**Histopathologic differences in adult and elderly patients with CRS**

Hannah Brown, MD

Sarah Khalife, MD

Pedro Escobedo, Medical Student

Veena Ganesan, BS

Peter Filip, MD

Peter Papagiannopoulos, MD

Paolo Gattuso, MD

Pete Batra, MD

Bobby Tajudeen, MD, FARS

Rush Medical College

**Background:**

Adult and elderly patients with chronic rhinosinusitis (CRS) undergo similar therapeutic management. Few studies have undertaken sinonasal tissue-level comparisons of these groups. This study examines histopathologic differences between adults (>18, <65 years) and the elderly (≥65 years) with CRS, with the goal of optimizing medical management.

**Methods:**

In a retrospective cohort analysis, demographic factors, comorbidities, and a structured histopathologic report of 13 variables were compared across adult and elderly CRS patients who underwent functional endoscopic sinus surgery.

**Results:**

300 adult (158 aCRSsNP, 142 aCRSwNP) and 77 elderly (38 eCRSsNP, 39 eCRSwNP) patients were analyzed. Mean age of the adult cohort was 44.4±12.4 years, while that of the elderly cohort was 71.9±5.9 years (p<0.001). Significantly more adults compared to elderly individuals demonstrated a positive atopic status (79.7% vs. 64.0%, p=0.004). Elderly patients exhibited higher rates of comorbid DM than adult patients (21.6% vs. 10.3%, p=0.009). Adults exhibited more tissue eosinophilia (43.4% vs. 28.6%, p=0.012) compared to elderly patients. Conversely, the elderly demonstrated significantly more fungal elements (11.7% vs. 3.0%, p=0.004), and trended toward increased overall inflammation (63.6% vs. 55.3%, p=0.118) and tissue neutrophilia (35.1% vs. 27.3%, p=0.117), compared to adults. Of note, incidence of DM among the elderly was not significantly associated with fungal elements on histopathologic examination.

**Conclusion:**

Sinonasal tissue of adult and elderly CRS patients demonstrates clear histopathologic differences. Patient comorbidities, in addition to tissue-level characterization, may provide further context in management optimization.

8:07am - 8:13 am

**Medical therapy for CRS is associated with a decrease in disease burden and type 2 inflammation**

Eli Stein, Medical Student

Alexander Schneider, MD

Regan Harmon

Saied Ghadersohi, MD

Atsushi Kato, PhD

Stephanie Shintani-Smith, MD, MS

David Conley, MD, FARS

Kevin Welch, MD, FARS

Robert Kern, MD, FARS

Bruce Tan, MD, MS

Northwestern University Feinberg School of Medicine

**Background:**

Appropriate medical therapy (AMT) is first line treatment for patients with Chronic Rhinosinusitis (CRS). Here, we evaluate whether AMT is associated with a decrease in Type 2 (T2) inflammatory markers and whether that change is correlated with changes in clinical measures of disease burden.

**Methods:**

51 patients with CRS were seen before and after AMT. Patients were prescribed a combination of oral antibiotics, oral steroids, and intranasal steroids based on phe-

## PROGRAM ABSTRACTS

notype and severity of CRS. At each visit, patients completed a SNOT-22, a CRS-PRO, and underwent a CT scan (Lund-Mackay Score or LMS) and endoscopy (Lund-Kennedy Score or LKS). Middle meatal mucus collected at each visit underwent Luminex analysis to quantify ECP, IL-5, and IL-13, three known T2 biomarkers. Paired Samples Wilcoxon tests compared change in cytokine levels, and Spearman's correlation with Benjamini & Hochberg correction compared inflammatory markers to disease measures.

## Results:

51 (100%) patients received intranasal steroids, 42 (82%) patients received oral antibiotics, and 34 (67%) patients received oral steroids. Median time between the two visits was 35 days. ECP (1276.5 to 353.4ng/ml,  $p<0.001$ ), IL-5 (11.8 to 1.8pg/ml,  $p=0.007$ ), and IL-13 (7.6 to 2.0pg/ml,  $p=0.007$ ) all decreased from before to after AMT. SNOT-22 (43 to 20), CRS-PRO (26 to 16), LKS (6 to 2), and LMS (11 to 7) all decreased as well ( $p<0.001$  for all). Change in ECP was associated with change in LKS ( $r=0.51$ ,  $p=0.015$ ), while change in IL-5 was associated with change in total CRS-PRO score ( $r=0.40$ ,  $p=0.046$ ).

## Conclusions:

A short course of AMT for CRS is associated with a decrease in T2 biomarkers, with a corresponding associated decrease in specific disease measures.

8:14 am - 8:20 am

**Long-acting corticosteroid matrices improve CRS cardinal symptoms**

Brent Senior, MD, FARS  
Allison Gartung, PhD  
Robert Kern, MD, FARS  
Anders Cervin, MD, PhD  
Joanne Rimmer, A/Prof  
Agnieszka Wrobel  
James Shao

Vineeta Belanger, SVP Clinical Affairs

## Background:

Designed to locally treat chronic rhinosinusitis (CRS) for up to 24 weeks, LYR-210 is an implantable corticosteroid matrix that demonstrated rapid, durable, and clinically meaningful improvements in the LANTERN study. LYR-210 (7500µg) achieved statistical significance compared to control in improving the 3 cardinal symptom composite (3CS) score at week 24. We further evaluated the shifts in 3CS severity from baseline to week 24 in the LANTERN study.

## Methods:

Surgically naïve CRS subjects received bilateral administration of LYR-210 (7500µg) (N=21) or sham-procedure control (N=23) in the Phase 2 multicenter, blinded, randomized, controlled LANTERN study. Severity of 3CS (nasal blockage, nasal discharge, and facial pain) was categorized as: None [0-1.5), Mild [1.5-4.5), Moderate [4.5-7.5), and Severe [7.5-9]. Between group comparisons were conducted using Fisher's exact test

at a 1-sided significance level of 0.05.

## Results:

A significantly higher proportion of LYR-210 (7500µg)-treated subjects improved from Moderate or Severe at baseline to Mild or None in 3CS at week 24 compared to control (70% vs. 26.1%;  $p=0.005$ ). Moreover, 90.5% of LYR-210 (7500µg)-treated subjects improved by  $\geq 1$  severity category in 3CS at week 24 vs. 47.8% of control subjects ( $p=0.003$ ). No subject reporting Severe 3CS at baseline remained Severe at week 24 in the LYR-210 (7500µg) group, compared with 33.3% of subjects in the control group.

## Conclusions:

As LYR-210 (7500µg) demonstrated significant improvement in 3CS severity at week 24, achieving Mild or None in some LANTERN subjects, it may be an effective long-acting treatment option for CRS patients.

8:21 am - 8:27 am

**Effect of dupilumab on eustachian tube dysfunction in patients with CRS**

Michael Chang, MD  
Pooya Roozdar, Visiting Scholar  
Yi-Tsen Lin  
Jennifer Lee  
Jayakar Nayak, MD  
Zara Patel, MD, FARS  
Peter Hwang, MD, FARS  
Stanford University School of Medicine

## Objective:

Eustachian tube dysfunction (ETD) is commonly seen in patients with chronic rhinosinusitis with nasal polyps (CRSwNP). We studied how dupilumab affects ETD in CRSwNP.

## Methods:

We retrospectively studied adult patients with CRSwNP who initiated dupilumab between 2018-2022. ETD was assessed with the ETDQ-7 questionnaire, routinely collected at all visits in our clinic. ETDQ-7 was recorded at pre-treatment baseline and 1, 3, 6, 12, 18, and 24 months after dupilumab initiation. ETDQ-7  $>14.5$  was considered ETD, and  $\Delta\text{ETDQ7} >3.5$  was considered clinically meaningful change. SNOT-22, Lund-Kennedy (LK) endoscopy scores, comorbidities, otologic history, and medication use were also collected. ETDQ-7 change over time was assessed with repeated measures ANOVA. Correlations between ETDQ-7, SNOT-22, and LK were measured with Pearson coefficient ( $r$ ). Multivariate regression was used to identify factors associated with improvement.

## Results:

37 patients were studied. 36/37 (97.3%) patients had undergone prior sinus surgery, though dupilumab was most commonly started  $>24$  months (mean 41.4 months) since surgery. In 16 patients (43.2%) with ETD at baseline, ETDQ-7 significantly improved over 24

## PROGRAM ABSTRACTS

months (28.6±7.4 to 21.7±10.2,  $p<0.001$ ). 12/16 (75.0%) patients achieved clinically meaningful improvement. Among all patients, ETDQ-7 strongly correlated with SNOT-22 ( $r=0.700$ ), SNOT-22 ear subdomain ( $r=0.802$ ), and LK polyp subscore ( $r=0.742$ ). ETD improvement was significantly associated with higher baseline ETDQ-7 ( $\beta=0.03$ , 95%CI 0.01-0.05) and prior history of ear tubes ( $\beta=0.47$ , 95%CI 0.08-0.86). Conclusion: CRSwNP-associated ETD is likely to improve on dupilumab. ETD symptoms correlate with polyp severity and disease-specific quality of life.

8:28 am - 8:34 am

### **Salicylate limited diet in aspirin exacerbated respiratory disease**

Diana Bigler, MD  
Stilianos Kountakis, MD, PhD, FARS  
Edie Threlkeld, MS-3  
Augusta University Medical Center

#### Objectives/hypothesis:

Aspirin exacerbated respiratory disease is associated with a spectrum of sinonasal and respiratory manifestations. Our objective was to study the subjective and objective measurements of sinonasal manifestations of AERD in patients pursuing a salicylate limited diet.

#### Study Design:

Retrospective cohort study.

#### Methods:

All patients with AERD referred to our tertiary care rhinology clinic from 2011-2021 who reported compliance with a salicylate limited diet were included in this study. Sino-Nasal Outcome Test (SNOT-22) scores and Lund-Kennedy (LK) endoscopy scores were reviewed before and after implementation of the salicylate limited diet.

#### Results:

Eighteen patients with AERD who reported compliance with a salicylate limited diet were identified. Before and after implementation of the salicylate limited diet, patients had an average SNOT-22 score of 27.9 and 21.8, respectively, providing an average decrease in SNOT-22 score of 6.2 ( $p=.18$ , CI: 0.88-11.4). Two SNOT-22 subdomains of "blowing nose" and "cough" were statistically reduced ( $p<0.05$ ). LK endoscopy scores were on average 6.5 compared to 2.6 in patients with AERD after introduction of dietary modification, with average decrease of 3.7 ( $p<0.001$ , CI: 2.2-5.2).

#### Conclusions:

Patients with AERD who implement a salicylate limited diet show subjective and objective improvement in sinonasal disease.

8:35am - 8:45 am

### **Q&A**

## **Women in Rhinology Section Session**

8:45 am – 9:30 am

### **Panel: Ensuring diversity in rhinologic research**

Moderators: Elina Toskala, MD, FARS and Troy Woodard, MD, FARS

Panelists: Sandra Brooks, MD; Claire Hopkins, MD

9:30 am – 9:40 am

### **Anatomy, physiology, psychology, pathology of the female vs male nose and sinuses**

Speaker: Devyani Lal, MD, FARS

9:40 am – 9:50 am

### **Sex-based differences in access and outcomes in rhinology and neurorhinologic procedures**

Speaker: Vijay Ramakrishnan, MD, FARS

9:50 am – 10:00 am

### **Guidelines in managing rhinologic pathology in pregnancy**

Speaker: Satish Govindaraj, MD, FARS

10:00 am - 10:30 am

### **Break with Exhibitors in Franklin Hall**

## **Sinus Surgery I**

Moderators: Kristine Smith, MD; Zachary Soler, MD, FARS; Abtin Tabaei, MD, FARS

10:30 am - 10:36 am

### **Medical and surgical treatments of chronic rhinosinusitis share common mechanisms of action**

Audrey Pelletier, PhD

Axel E. Renteria, Dr.

Ali Filali- Mouhim

Martin Desrosiers, Professor

Hospitalier de l'Université de Montréal (CRCHUM)

#### Introduction:

Therapies for chronic rhinosinusitis (CRS) include both surgical and medical treatments centring around modulation of inflammation as well as control of bacterial burden. In optimal circumstances, successful therapies lead to a well ventilated sinus cavity with minimal epithelial damage and low levels of pathogenic species.

#### Purpose:

This research aims to assess whether similarities exist in terms of mechanism in these quite diverse therapies given the common outcome.

#### Method:

Existing transcriptomic and microbiome profiles from previously performed clinical trials in CRS using surgery, low-dose azithromycin, and topical probiotic bacteria were combined and assessed for commonalities in response. To identify similarities, gene set enrichment analysis (GSEA) was used to pinpoint overarching trends as opposed to individual genes.



## PROGRAM ABSTRACTS

## Results:

Regardless of treatment modality employed, successful response was characterized at the molecular level by a reduction in type one and interferon mediated inflammation, restoration of cell cycle from paralysis, and epithelial restoration. Microbiome studies showed that reductions of *Staphylococcus aureus* with azithromycin and topical probiotics were not observed following surgery, which rather featured increased presence of *S. aureus*.

## Interpretation:

Recovery from CRS appears to require a reduction in type one inflammation and restoration of the epithelial barrier function, offering new therapeutic targets for clinical management of the disease. Inconsistency in observed microbiome changes may reflect post-operative changes associated with modification of sinus anatomy, or introduction of *S. aureus* during the surgical procedure or in the post-operative period.

10:37 am - 10:43 am

**Systematic review: Biologics versus surgery in CRSwNP**

Nirushan Narendran, MS  
Eugene Chang, MD, FARS  
Barite Gutama  
James Patterson  
Ahlam Saleh  
University of Arizona

There is a significant discussion about the decision between surgery or biologics in CRSwNP patients. We sought to perform a systematic review to identify standardized measures for each therapy in CRSwNP and identify if there were any direct comparison studies between therapies.

12440 articles were obtained from Embase, Scopus and Cochrane databases for biologics and sinus surgeries in CRSwNP. Subjective measures: Smell Identification Test and Sinonasal outcome test (SNOT) while objective measures: Nasal polyp score (NPS) and Lund-MacKay CT (LMCT). Of the 12440 articles, 31 were selected for full-text review based on our PRISMA criteria. 13/31 articles had evaluated pre & post-surgical outcomes while 18/31 articles evaluated pre & post-biologics. From the surgical group: 8/13 reported 1.5-2 times the minimally clinical importance difference (MCID) in SNOT scores, 2/13 reported 7-9-point improvement in LMCT scores and 3/13 reported 3-4-point improvement in smell tests. From the biologics group: 18/31 evaluated the efficacy of multiple biologic therapies in CRSwNP that target different components of the Th2 pathway. The data from these 18 articles were results from the six major Phase 3 clinical trials. From the biologics group: 8/18 reported 2-3 times the MCID in SNOT scores, 8/18 reported 7-12-point improvement in LMCT scores, 6/18 reported 2-10-point improvement in smell tests but all papers reported 1-2.5-point improvement in NPS. We identified no direct comparative studies between sinus surgery and biologics.

Moreover, success measures and length of follow-up varied significantly in the surgical group. Future studies performing direct comparisons of biologics and surgery in a single cohort would be beneficial assessing CRSwNP.

10:44 am - 10:50 am

**Bioabsorbable drug eluting microspoon for frontal sinus surgery**

Tripti Brar, MBBS, MD  
Amar Miglani, Dr.  
Devyani Lal, MD, FARS  
Michael Marino, MD, FARS  
Mayo Clinic

## Background:

Clinicians employ cortico-steroid-eluting frontal stents to maintain ostial patency in certain circumstances. VECTRA-F is a drug delivery microspoon FDA approved for intra-operative placement during frontal sinusotomy. Safety and effectiveness of triamcinolone-impregnated VECTRA-F microspoon (TIVM) in maintaining frontal ostial patency has not been reported.

## Methods:

Patients who underwent sinus surgery from August 1, 2021 to February 28, 2022 at our institution were reviewed to identify those with intraoperative placement of TIVM in the frontal outflow tract. Ostium patency was evaluated by non-blinded examiner through nasal endoscopy at follow-up visits and SNOT-22 score recorded.

## Results:

20 patients and 35 frontal sinuses were treated with TIVM. Eleven patients had CRSwNP, 3 had allergic fungal sinusitis, 9 had coexistent asthma and 2 had AERD. Eleven patients were undergoing revision sinonasal surgery. Of the 35 ostia, 33 (94.3%) remained fully patent and 2 (5.7%) had edema at the follow-up visit conducted within 1 month. On longer-term follow up of the 2 patients with edema, both were fully patent at 160 days. One ostium that was patent at one month, was found stenosed at last follow-up (97 days). Mean pre- and post-operative SNOT-22 score (N=18 patients) was  $39 \pm 15.2$  and  $19.9 \pm 17.5$  respectively, over a mean follow-up period of 69.5 days (SD  $\pm 53$ ). No complications were reported post-operatively.

## Conclusion:

In the first study undertaken to evaluate safety and efficacy of VECTRA-F microspoon impregnated with triamcinolone, we found it safe and effective at maintaining frontal sinus ostium patency and improving subjective symptoms of CRS, irrespective of polyp status, revision surgery or co-existent asthma.

## PROGRAM ABSTRACTS

10:51 am - 10:57 am

**Effect of nasal packing saturated with ciprofloxacin and dexamethasone following sinus surgery**

Norman Orabi, MD  
 Camilo Reyes, MD, FARS  
 Hassan Ramadan, MD, FARS  
 Chadi Makary, MD, FARS  
 West Virginia University School of Medicine

**Background:**

Nasal packing can facilitate post-operative hemostasis and local drug delivery to the surgical site following endoscopic sinus surgery (ESS). We aim to assess the effects of bioabsorbable nasal packing saturated with ciprofloxacin and dexamethasone on post-operative endoscopic scores.

**Methods:**

All adult patients initially presenting to a rhinology clinic from January 2021 to September 2021 who underwent symmetrical bilateral ESS were included. Patients were randomized to receive ciprofloxacin-dexamethasone solution in one nasal cavity and saline on the contralateral side to saturate bioabsorbable nasal packing. Endoscopic examinations were recorded at 1-2 weeks, 3-4 weeks, 6-8 weeks, and 3 months post-operatively. Two blinded rhinologists graded the endoscopic examinations using the modified Lund-Kennedy (LK) scoring system. Statistical analysis was performed with Wilcoxon signed-rank test for LK scores and Spearman's correlation coefficient for interrater reliability.

**Results:**

There were 32 patients with 60 total scored endoscopic examinations. At the 1-2 week visit, ciprofloxacin-dexamethasone was associated with less edema (mean 0.78 vs 1.06,  $p=0.024$ ) and greater crusting (mean 1.04 vs 0.71,  $p=0.019$ ). At the 3-4 week visit, ciprofloxacin-dexamethasone was associated with less scarring (mean 0.04 vs 0.26,  $p=0.020$ ). Otherwise, there were no significant differences in LK scores. Spearman's correlation coefficient was 0.485 ( $p<0.001$ ) for LK score interrater reliability.

**Conclusion:**

Bioabsorbable nasal packing saturated with ciprofloxacin-dexamethasone solution following ESS was associated with less short-term edema and scarring but greater crusting. There were no significant differences beyond 3-4 weeks.

10:58 am - 11:15 am

**Q&A****SINUS SURGERY II**

*Moderators: Mark Arnold, MD; Philip Chen, MD, FARS; Ashleigh Halderman, MD, FARS*

11:15 am - 11:21 am

**Comparison of endoscopic Draf 2 and Draf 3 procedure outcomes in CRSwNP**

Samuel Racette, MD  
 Derek Wu, Fellow  
 Caroline Price  
 Alexander Schneider, MD  
 David Conley, MD, FARS  
 Kevin Welch, MD, FARS  
 Robert Kern, MD, FARS  
 Bruce Tan, MD, MS  
 Northwestern University

**Background:**

Surgical treatment of Chronic Rhinosinusitis with nasal polyps (CRSwNP) may include Draf 2 and Draf 3 procedures. The latter a more extensive approach advocated for recalcitrant cases. We compared the outcomes of Draf 2 and Draf 3 frontal sinusotomies in CRSwNP patients.

**Methods:**

CRSwNP patients ( $n=110$ ) who had either Draf 2 frontal sinusotomy or Draf 3 from 2014-2018 at a tertiary rhinology practice were examined. To control for observed confounders between both groups; 25 cases of Draf 3 were matched with 31 cases of Draf 2 on basis of demographics, revision surgery, AERD, and pre-ESS radiographic severity. Outcomes obtained 2-5 years post-ESS, included CT scans graded with Lund-Mackay (LM) and specific frontal scoring using the modified Lund-Mackay score (fmLM), patient reported measures (SNOT-22 and CRS-PRO), and Total Polyp Score (TPS).

**Results:**

In the initial cohort ( $n=110$ ), those undergoing Draf 3 procedures had significantly higher rates of revision surgery, pre-ESS LM scores, fmLM scores and AERD status. Matching ( $n=25$  Draf 3,  $n=31$  Draf 2) resulted in groups without significant differences in these confounders. SNOT-22, LM, fmLM, and TPS following surgery in both groups post-ESS. The degree of improvement was not significantly different between the Draf 2 and Draf 3 group (SNOT 22:  $-18.05$  v  $-22.07$ ,  $p=0.63$ ; LM:  $-9.48$  v  $-7.40$ ,  $p=0.33$ ; fmLM:  $-3.00$  v  $-3.17$ ,  $p=0.85$ ; TPS:  $-2.80$  v  $-3.65$ ,  $p=0.27$  respectively). Post-ESS, Draf 2 patients had significantly lower CRS-PRO score than their Draf 3 counterparts ( $12.97$  v  $20.54$ ,  $p=0.009$ ).

**Conclusion:**

In CRSwNP patients with matching disease characteristics, both Draf 2 and Draf 3 procedures lead to similar improvement in radiographic and patient reported outcomes.

## PROGRAM ABSTRACTS

11:22 am - 11:28 am

**Maxillary sinus volume changes after surgery in silent sinus syndrome**

Juan Carlos Hernaiz, MD MSc  
 Marwan Alqunaee, Dr.  
 Saba Moghimi  
 Bader Alim  
 Farnaz Javadian  
 Saba Vafaei-Nodeh  
 Athenea Rodriguez, Research coordinator  
 Amin Javer, MD, FARS  
 University of British Columbia

**Background:**

Chronic maxillary atelectasis (CMA) and silent sinus syndrome (SSS) are rare conditions where negative pressure collapses the walls of the maxillary sinus, eventually leading to orbital deformities. Treatment for CMA and SSS involves functional endoscopic sinus surgery (FESS) with or without orbital reconstruction. However, the latter remains controversial. Objective data regarding maxillary and orbital volume changes after FESS in these patients is lacking.

**Methods:**

Three reviewers retrospectively compared preoperative and postoperative maxillary sinus and orbital volumes obtained from CT scans of 22 patients diagnosed with CMA or SSS who underwent FESS between January 2006 and December 2020. A subset of patients who had contralateral FESS for isolated maxillary sinusitis served as procedural controls.

**Results:**

The average patient age was 45 years (range 19-74 years) and half were female. Eleven patients had orbital deformities preoperatively. Inter and intra-rater reliabilities for volume measurements were deemed excellent for all reviewers. Orbital volumes remained unchanged after surgery in CMA/SSS patients and procedural controls (paired Wilcoxon test  $p > 0.05$ ). Maxillary volumes in CMA/SSS patients increased from a median of 8.1 cm<sup>3</sup> [1.70, 18.3] to 8.9 cm<sup>3</sup> [2.40, 18.8] after surgery (paired Wilcoxon test  $p=0.005$ ), with no change observed in procedural controls (paired Wilcoxon test  $p=0.94$ ). None of the 22 patients required orbital reconstruction after an average of 2.5 +/- 1.5 years of follow-up.

**Conclusion:**

FESS is associated with an increased maxillary sinus volume in patients with CMA/SSS. Our results suggest that surgery improves maxillary volume and halts disease progression.

11:29 am - 11:35 am

**The effectiveness of postoperative gabapentin for reduction of opioid consumption and pain control**

Hong-Ho Yang, BS  
 Tara Wu, MD  
 Jeffrey Suh, MD, FARS  
 Marilene Wang, MD, FARS  
 Michael Holliday, MD  
 Daniel Beswick, MD, FARS  
 Huan Zhang, Fellow  
 Christine Wells, Dr.  
 Justin McCormick, Dr.  
 Tom Maxim, Dr.  
 Jivianne Lee, MD, FARS  
 David Geffen School of Medicine at UCLA

**Objective:**

This study investigates the impact of postoperative gabapentin on opioid consumption and pain control following endoscopic sinus surgery (ESS) and/or septoplasty.

**Methods:**

Patients who underwent ESS and/or septoplasty at a single institution from 2021 to 2022 were enrolled. All patients received postoperative hydrocodone-acetaminophen for pain control. Half of all patients were also offered gabapentin for the first postoperative day in addition to hydrocodone-acetaminophen. Subjects completed the Revised American Pain Society Patient Outcome Questionnaire 24 hours and 7 days after surgery. We conducted multivariable regression analysis to assess opioid consumption and improvement in pain scores in the first week between gabapentin and non-gabapentin groups.

**Results:**

A total of 102 subjects, 51 in each arm, were enrolled. The mean age was 52 years and 53% of participants were female. Patients in the gabapentin arm consumed significantly lower amounts of hydrocodone in the first week compared to patients in the non-gabapentin arm (mean: 16.3 mg vs. 21.6 mg), after controlling for age, sex, mg of opioids prescribed, type of procedure, and baseline pain scores 24 hours after surgery ( $B = -8.07$ ; 95% C.I. = [-14.52, -0.38],  $P=0.026$ ). However, patients in both arms exhibited similar improvement in pain severity and sleep interference in the first 7 days ( $P=0.48$ ).

**Conclusion:**

To the best of our knowledge, this is the first study to investigate the impact of postoperative gabapentin on opioid consumption and pain control following ESS and/or septoplasty. Our analysis demonstrated that postoperative gabapentin effectively reduced opioid use without significantly impacting pain recovery during the first postoperative week.

## PROGRAM ABSTRACTS

11:36 am - 11:42 am

**Tobacco use increases the risk of CRS among patients undergoing ESS**

Amarbir S. Gill, MD

Huong Meeks

Karen Curtin

Kerry Kelly

Jeremiah Alt, MD, PhD, FARS

University of Utah Health

**Objective:**

Although it has been suggested that tobacco use may contribute to the development of chronic rhinosinusitis (CRS), the data remain limited due to small sample sizes, inadequate study design, and/or self-reported diagnoses of CRS. Here, we utilized a large state population database to assess the association between physician-diagnosed tobacco use and CRS among patients undergoing endoscopic sinus surgery (ESS).

**Methods:**

Employing a case-control study design, the Utah Population Database was queried for patients age > 18 with diagnoses of CRS and/or tobacco use, as well as those with a history of ESS, between 1996 and 2018. Tobacco use was compared between patients with CRS and random population controls matched 4:1 on sex, birth year, birthplace, and familial information. Conditional logistic regression models were used for comparisons between CRS patients and their matched controls. All analyses were repeated, additionally adjusting for race, ethnicity, tobacco use, asthma history, and interaction between tobacco use and asthma history

**Results:**

A total of 200,370 patients (CRS, n=34,350; control, n=166,020) were included in the final analysis. Patients with CRS were significantly more likely to demonstrate a history of tobacco use than controls (19.6% vs. 15.0%) (p<0.001), with an adjusted odds ratio (aOR) of 1.42, 95% CI 1.37-1.47, (p<0.001). More patients with CRS and comorbid asthma used tobacco (19.5%) than controls with asthma (15.0%) (p<0.001).

**Conclusion:**

Physician diagnosis of tobacco use may be an independent risk factor for the development of CRS among patients undergoing ESS in a state with low overall prevalence of cigarette smoking.

11:43 am - 11:49 am

**The impact of resident and fellow participation on outcomes following endoscopic sinus surgery**

Karandeep Randhawa, BS

Avneet Randhawa, BS

Imran Khawaja, BS

Owais Aftab, BS

Prayag Patel, MD

Christina Fang, MD

Jean Anderson Eloy, MD, FARS

**Objective:**

This study aimed to analyze the effects of resident and fellow participation (RFP) on adverse outcomes following endoscopic sinus surgery (ESS).

**Methods:**

This retrospective analysis utilized the 2005-2012 National Surgical Quality Improvement Program database. Current procedural terminology codes were used to identify ESS cases which were divided into cohorts based on RFP. Prolonged length of stay (LOS), operation time (OT), and anesthesia time (AT) were defined as values greater than the 90th percentile. Chi square analyses, Mann-Whitney U tests, and adjusted binary logistic regression were used to determine effects of RFP on outcomes.

**Results:**

Selection criteria yielded 208 cases of ESS, including 79 RFP and 129 non-RFP cases. The RFP cohort had a greater proportion of hypertensive (41.8% vs. 25.6%, p<0.001) and steroid-using (7.6% vs. 0.8%, p<0.001) patients but a smaller proportion of obese (34.2% vs. 60.5%, p<0.001) patients. Complications analysis indicated the RFP cohort had a greater mean OT (328.6 vs. 107.4 minutes, p<0.001) and LOS (3.6 vs. 0.6 days, p<0.001) than the non-RFP cohort. However, surgical complications, medical complications, and unplanned reoperation rates did not differ significantly. Logistic regression adjusted for preoperative characteristics indicated RFP cases had increased odds of prolonged AT (OR 8.710, 95% CI 2.498-30.372; p=0.001) and prolonged OT (OR 10.876, 95% CI 2.939-40.244); p<0.001), but RFP cases did not have increased odds of complication (p=0.110), prolonged LOS (p=0.334), or unplanned reoperation (p=0.287).

**Conclusions:**

Although RFP was associated with increased OT, LOS, and AT, it was not associated with increased complications or reoperations following ESS.

11:50 am - 12:00 pm

**Q&A**

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm – 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Program Luncheon**

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

## PROGRAM ABSTRACTS

**Saturday, September 10, 2022**

**8:00 am – 12:00 pm**

**Breakout C**

**Salon C/D**

7:00 am – 8:00 am

Meet the Authors Poster Viewing & Breakfast  
Franklin Hall

## Allergy and Immunology in Rhinology Section Session

8:00 am – 8:45 am

Panel: Climate change is its effect on rhinologic disease

Moderator: Jean Kim, MD, FARS

Panelists: Regan Bergmark, MD, FARS; Kent Lam, MD, FARS; Amber Luong MD, PhD, FARS; Darryn Waugh, MD; Ben Zaitchik, MD

8:45 am – 9:15 am

**Immune Deficiencies and sinusitis**

Moderator: Chadi Makary, MD, FARS

Panelists: Antoine Azar, MD; Sandra Lin, MD, FARS

## Allergy and Rhinitis

*Moderators: Charles Ebert, MD, FARS; Katie Phillips, MD; Joshua Levy, MD, FARS*

9:15 am - 9:21 am

**Cost-effectiveness of inferior turbinate reduction vs immunotherapy for allergic rhinitis**

Michael Yong, MD, MPH MBA

Kaishan Aravinthan

Keshinisuthan Kirubalingam

Andrew Thamboo, MD

Evan Walgama, MD

University of British Columbia

Background:

Allergic rhinitis (AR) is a common condition that is frequently associated with nasal obstruction from inferior turbinate hypertrophy (ITH). Current guidelines support the use of subcutaneous allergen immunotherapy (SCIT) when patients fail pharmacologic management. However, there is a lack of consensus regarding the role of surgery, particularly inferior turbinate reduction (ITR), a treatment that we hypothesize is cost-effective compared to other available treatments.

Methods:

We conduct a cost-effectiveness analysis comparing the following treatment combinations over a 10-year time horizon: 1) pharmacotherapy (intranasal corticosteroid) alone, 2) pharmacotherapy with SCIT for

patients who fail pharmacotherapy, 3) pharmacotherapy with SCIT for patients who fail pharmacotherapy and then ITR for patients who fail SCIT, and 4) pharmacotherapy with ITR for patients who fail pharmacotherapy and then SCIT for patients who fail ITR. Results were reported as incremental cost-effectiveness ratios (ICERs), measured in \$USD per quality-adjusted life year (QALY). Deterministic and probabilistic sensitivity analyses tested the robustness of the results.

Results:

The analysis demonstrates that for patients who fail initial pharmacotherapy, ITR before SCIT is more cost-effective than SCIT before ITR. Probabilistic sensitivity analysis demonstrates that ITR before SCIT for patients who fail pharmacotherapy remained the most cost-effective option in 85% of scenarios. When surgery was performed in-office, ITR before allergy testing and SCIT obtained dominance.

Conclusion:

For many AR patients, ITR is a cost-effective treatment for those with persistent symptoms despite pharmacotherapy.

9:22 am - 9:28 am

**Real-world SLIT persistence and adherence**

Michelle Park, BS

Shrey Kapoor

Julie Yi

Nanki Hura, Dr.

Sandra Lin, MD, FAR

Johns Hopkins University School of Medicine

Background:

Sublingual immunotherapy (SLIT) adherence in the literature is often evaluated in closely monitored trials that may impact patient behavior; real-world SLIT adherence is relatively unknown. This systematic review intends to assess SLIT adherence in studies that reflect real-world settings.

Methods:

A literature search of PubMed, Embase, Cochrane, Web of Science, and Scopus for real-world studies examining SLIT adherence was performed. Monitored clinical trials were excluded. Paired investigators independently reviewed all articles. For this review, "persistence" was defined as continuing therapy and not being lost to follow-up and "adherence" as persistence in accordance with prescribed SLIT dose, dosing schedule, and duration. Article quality was assessed using a modified Newcastle-Ottawa scale and then converted to AHRQ standards (good, fair, and poor).

Results:

The search yielded 1596 nonduplicate abstracts, from which 32 articles (n=63,683 patients) met criteria. Twenty-six (81%) studies reported persistence rates ranging from 7.0% to 88.7%, and 18 (56%) reported adherence rates ranging from 9.6% to 97.0%. Twenty-one (66%) studies surveyed reasons for discontinuing



## PROGRAM ABSTRACTS

SLIT. All studies were Oxford level of evidence 2b and of good (n=12) to fair (n=20) quality.

**Conclusion:**

Reported rates of real-world SLIT persistence and adherence varied widely by study methodology (e.g., follow-up duration, objective vs subjective assessment). Studies with longer follow-up generally reported lower rates; 3-year persistence ranged from 7% to >54.6% and 3-year adherence from 9.6% to 49.0%. Future studies of SLIT adherence would benefit from following concordant definitions of persistence/adherence and standardized reporting metrics.

9:29 am - 9:35 am

**Variability in sinonasal allergen deposition explains asymmetric involvement in CCAD**

Daniel Spielman, MD  
John Delgado, MD, FARS  
Kiao Inthavong, Associate Professor  
Sarah Wise, MD, FARS  
Narinder Singh, Assoc Professor  
Patrick Warfield-McAlpine  
Emory University Hospital

**Background:**

In certain patients with atopy, allergens exacerbate sinonasal inflammatory conditions, such as allergic rhinitis and Central Compartment Atopic Disease (CCAD). Differences in the sinonasal distribution of inflammation often exist between the right and left sinonasal cavities of each patient. We hypothesize that differences in airflow and allergen deposition may explain differences in the observed distribution of inflammatory disease between the right and left nasal cavities of the same individual in CCAD.

**Objective:**

We aimed to assess differences in sinonasal allergen deposition between right and left side of an individual's nasal cavity.

**Methods:**

Computational fluid dynamics (CFD) simulations were used to track allergen deposition. A model was created from the sinus CT scan of a patient without sinonasal pathology. CFD analysis was performed to assess the distribution of various shaped inhaled particles between the right and left nasal cavities before and after middle turbinate (MT) resection.

**Results:**

CFD analysis demonstrates that allergen deposition varies significantly between the right and left sides of each model. Deposition varies with particle diameter, shape and size. Most particles deposit on the anterior surface of the MT and the septum at baseline. Following resection of the MTs, particle deposition significantly increases at the upper lateral nasal walls, sinuses, and nasopharynx.

**Conclusion:**

Allergen deposition varies considerably between the right and left nasal cavities in the same individual, both pre- and post-MT excision. Differences in allergen deposition may account for asymmetry in CCAD and other atopy related forms of CRSwNP between sides in the same individual and across individuals.

9:36 am - 9:42 am

**Vidian nerve diameter: A possible association with chronic rhinitis diagnosis**

Megha Chandna, Medical Student  
Emily Newstrom  
Alexander Choi, MD  
Masayoshi Takashima  
Michael Yim, MD  
Jason Ohlstein, MD, MPH  
Omar Ahmed, MD  
Texas A&M College of Medicine

**Background:**

Chronic rhinitis is characterized by prolonged rhinorrhea and nasal congestion. A possible contributing factor is the overactive parasympathetic activity of the vidian nerve. Disrupting parasympathetic fibers of the vidian nerve has been shown to reduce submucosal gland secretion, blood flow, and stromal edema. The objective of this study was to investigate the association between vidian nerve size and the diagnosis of chronic rhinitis.

**Methods:**

Data was retrospectively collected from sinus CT images of 30 patients with previous intervention for chronic rhinitis and 21 randomly selected control patients with available sinus CT imaging for non-rhinitis or sinusitis reasons. CT images were reviewed blindly, measuring vidian canal diameter as a surrogate for vidian nerve size (both at its midpoint and entry point into the pterygopalatine fossa (PPF)), length, and pneumatization pattern. Statistical analysis was used to determine if there was a significant difference in each of these parameters in the chronic rhinitis group compared to controls (p<0.05).

**Results:**

The mean vidian canal diameter at entry into the PPF was significantly smaller in chronic rhinitis patients compared to controls on both the left (0.32 vs. 0.43cm, p=0.002) and right (0.33 vs. 0.45cm, p=0.003). No significant difference was identified in length or pneumatization patterns.

**Conclusion:**

This study shows that the diameter of the vidian canal, and thus vidian nerve, at entry into the PPF may be inversely correlated with chronic rhinitis. Potential explanations include constriction of the vidian nerve contributing to chronic rhinitis. Further investigation of this phenomenon is needed to improve upon existing diagnostic and treatment strategies.

## PROGRAM ABSTRACTS

9:43 am - 9:49 am

**Cost-effectiveness of in-office posterior nasal nerve ablation**

Anirudh Saraswathula, MD, MS  
 Lekha Yesantharao, Medical Student  
 Christine Gourin, Professor  
 Nicholas Rowan, MD  
 Kevin Frick, Professor  
 Johns Hopkins University School of Medicine

**Objective:**

Chronic rhinitis is a difficult condition to treat, with significant impact on quality of life. Recently, in-office posterior nasal nerve ablation (PNNA) devices have offered a new tool to treat refractory chronic rhinitis, but their cost-effectiveness relative to traditional interventions such as vidian neurectomy (VN) and posterior nasal neurectomy (PNN) remains unexplored. We aimed to compare the cost-effectiveness of these interventions in chronic rhinitis refractory to medical management.

**Methods:**

A decision tree with embedded Markov models was created to compare the cost-effectiveness of PN, VN, and PNNA, measured in quality-adjusted life years (QALYs) over a 30-year time horizon with a \$100,000/QALY willingness-to-pay threshold. One- and two-way sensitivity analyses were completed.

**Results:**

VN and in-office PNNA both were more effective and less expensive than PNN. VN was cost-effective when compared to in-office PNNA (incremental cost-effectiveness ratio \$13,670.59/QALY). Sensitivity analysis found that in-office PNNA became cost-effective compared to VN when the risk of rhinitis symptoms recurring post-treatment in PNNA compared to VN fell below 1.43; this value was assumed to be 2.00 in the base case model. Other outcomes, such as the probability of dry eye after VN, cost of PNNA, and probabilities of post-operative/procedural bleeding were not found to considerably impact incremental cost-effectiveness.

**Conclusion:**

While in-office PNNA is an attractive therapeutic option for chronic rhinitis, VN was found to be cost-effective. Nonetheless, sensitivity analysis suggests that PNNA may be cost-effective relative to VN as long-term outcomes on the durability of its effects on chronic rhinitis emerge.

9:50 am - 10:00 am

**Q&A**

10:00 am - 10:30 am

**Break with Exhibitors in Franklin Hall****Smell and Taste**

*Moderators: Daniel Beswick, MD, FARS; Sanjeet Rangarajan, MD, FARS; Carol Yan, MD*

10:30 am 10:36 am

**Social determinants of health and olfactory dysfunction in older adults: A population-based analysis**

Eli Stein, Medical Student  
 Alexander Chern, MD  
 Honglei Chen, MD, PhD  
 Eric Shiroma, ScD  
 D.P. Devanand, MD  
 David Gudis, MD, FARS  
 Jonathan Overdevest, MD, PhD  
 Northwestern University Feinberg School of Medicine

**Background:**

Social determinants of health (SDoH) are environmental conditions that influence health outcomes. As olfactory dysfunction (OD) in older individuals is associated with increased morbidity and mortality, we sought to investigate the impact of specific SDoH on olfactory function.

**Methods:**

A cross-sectional analysis of the Health, Aging and Body Composition Study, an epidemiologic cohort study, was performed. Olfactory function was assessed utilizing both a self-report and an objective olfactory test (Cross-Cultural Smell Identification Test). Multivariable logistic regression models were performed to examine associations between specific SDoH with self-reported (sOD) and objective (oOD) olfactory dysfunction. Differences in sensitivity and specificity were evaluated with sample tests for equality of proportions.

**Results:**

Of 2,219 participants, 13% had oOD while 10% had sOD. Individuals identifying as either male or Black race had higher odds of oOD (OR:2.17,  $p<0.001$ ; OR:1.41,  $p=0.037$ ), while those reporting family incomes  $\geq$ \$50,000 had lower odds of oOD (OR:0.52,  $p=0.026$ ), adjusting for covariates. No specific SDoH was significantly associated with sOD. The sensitivity and specificity of sOD for oOD was 23.1% and 92.0%, respectively. sOD had greater sensitivity in females than males (30.8% vs. 18.8%,  $p=0.030$ ), while specificity varied significantly depending on family income (range:90.0-94.8%,  $p=0.033$ ).

**Conclusions:**

Utilizing a large population-based study, we find disparities in the prevalence and self-recognition of OD among individuals of different gender, race, and income levels. Further effort is needed to evaluate factors propagating these disparities and to raise awareness of OD across all patient populations.

## PROGRAM ABSTRACTS

10:37 am - 10:43 am

**Correlation of computed tomography scores to measures of olfaction**

Tiffany Chen  
 Shreya Chidarala  
 Gabrielle Young  
 Seth Jeong, Clinical research fellow  
 Shaun Nguyen, Dr.  
 Thomas Edwards, Dr.  
 Rodney Schlosser MD, FARS

**Background:**

While various sinus computed tomography (CT) scoring systems have been proposed and used in the literature, no single system has been identified as superior. Strength of correlations between CT scoring systems and measures of olfaction also remain unclear.

**Methods:**

A systematic review of PubMed, CINAHL, Scopus, and Cochrane Library was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analyses guideline. Studies that reported both CT scores and measures of olfaction in patients with CRS were included.

**Results:**

A total of 37 studies were eligible for meta-analysis. Out of 8035 patients, 55.6% were male patients and 53.2% had chronic rhinosinusitis with nasal polyps. Analysis by meta-regression was performed of Lund-Mackay vs. Smell Identification Test-40 (SIT-40, N = 12 studies), Brief Smell Identification Test (BSIT, N = 10 studies), Sniffin' Sticks (N = 10 studies), and Toyota & Takagi (T&T) olfactometry (N = 4 studies). Significant moderate correlation was found between LM and SIT-40 ( $R^2=0.612$ ,  $p<0.001$ ) and LM and Sniffin' Sticks ( $R^2=0.612$ ,  $p<0.001$ ). Correlation between LM and BSIT approached significance ( $R^2=0.461$ ,  $p=0.054$ ). No significant correlations were noted between LM and T&T olfactometry and between LM and Sniffin' Sticks when stratified by nasal polyp status.

**Conclusion:**

There is significant moderate correlation of current CT scoring systems to SIT-40 and Sniffin' Sticks. Further research should focus on associations of CT scores of the sinuses and of the olfactory cleft to other measures of olfaction across multiple studies.

10:44 am 10:50 am

**Will septoplasty improve my sense of smell? A prospective observational study**

Grant Gillman, MD  
 Eric Wang  
 Stella E. Lee, MD  
 Barry Schaitkin, MD  
 Anna Bakeman, MD  
 Mark Mims, MD  
 Yue-Fang Chang  
 University of Pittsburgh

The literature examining olfactory outcomes in rhinologic surgery derives mostly from studies in chronic rhinosinusitis/skull base surgery as opposed to patients undergoing nasal airway surgery.

A prospective study was designed to study whether septoplasty with turbinate reductions might benefit olfaction, identify potentially favorable variables in that regard and correlate olfactory outcomes with changes in patients' perception of nasal airflow. A secondary aim was to assess an objective test of olfaction (UPSIT) as compared to a patient reported outcome (11-point olfactory Likert scale).

Pre and postop nasal obstruction was evaluated using the Nasal Obstruction Symptom Evaluation (NOSE) scale and an 11-point Ease-of-Breathing (EOB) Likert scale (0=complete obstruction, 10=easy, unobstructed breathing). Pre and postop olfaction was evaluated using the UPSIT test and an 11-point olfactory Likert scale (0-10, where 0=no sense of smell at all).

80 patients were studied with mean followup at 98.4 days postop. Higher olfaction scores (Likert) correlated with lower nasal obstruction scores at all intervals.

The strongest correlations noted were between the magnitude of change (the actual degree of improvement) in patient reported nasal airway obstruction and the extent of improvement in olfactory Likert scores. This finding has never been reported and would suggest that the greater the extent to which the surgeon can improve upon the nasal airway obstruction, the greater the likelihood of improving olfaction.

Olfactory Likert scores were poorly correlated with UPSIT scores, likely related to the limited focus (odor identification only) of the UPSIT.

The study design and novel findings will be presented in greater detail.

10:51 am 10:57 am

**Gabapentin for COVID-19 induced parosmia**

Do-Yeon Cho, MD  
 Jaime Pena-Garcia, MD  
 Timothy Norwood, MD  
 Jessica Grayson, MD  
 Bradford Woodworth, MD, FARS  
 University of Alabama at Birmingham

**Introduction:**

The emergence of the COVID-19 pandemic brought awareness to the impact of viral infections on olfactory function. COVID-19 olfactory dysfunction (OD) is frequently linked with the development of parosmia. The objective of this study is to evaluate the therapeutic potential of gabapentin for parosmia after COVID-19 infection.

**Methods:**

Patients who visited the Smell and Taste Clinic

## PROGRAM ABSTRACTS

between 9/2021 and 2/2022 were considered eligible for review. The University Pennsylvania Smell Identification Test (UPSIT) was performed during initial clinic visits, and parosmia (e.g., foul smell) was identified via patient history. Gabapentin (100mg daily x 7days, 200mg daily x 7days, 300mg daily x 7days) was prescribed to parosmia patients with at least a 6-month history of OD and abnormal UPSIT (hyposmia/anosmia) scores. The patient's response was graded as none, mild, moderate, or significant via phone interviews after 3 weeks.

**Results:**

Of 84 patients with COVID-19 induced OD, 13 patients (15.8%, all-female, mean age 38.4 (range 16-67), mean UPSIT 21.2+/-7.4)) were identified to have parosmia as a major complaint after COVID-19 infection. Gabapentin was prescribed to 10 patients with 3 refusing therapy. Two patients discontinued due to medication intolerance (daytime drowsiness). Parosmia was reduced in 7/8 patients who completed 3 weeks of treatment (mild 1, moderate 1, significant 5 (62.5%)), and one patient voiced no improvement.

**Conclusion:**

More than 80% of COVID-19 induced parosmia patients responded to gabapentin treatment, with 60% being significant. Gabapentin may be an effective treatment option for those suffering from parosmia.

10:58 am - 11:04 am

**Taste loss correlation with cognition**

Shahzeb Hasan, BS  
Zachary Soler, MD, FARS  
Rodney Schlosser, MD, FARS  
Spencer Payne, Associate Professor  
Jose Mattos, MD, MPH

**Introduction:**

The association of gustatory dysfunction (GD) with quality of life (QOL) and cognition in older adults is understudied. Our objective was to study the prevalence of GD in the community and explore impacts and associated factors.

**Methods:**

A prospective, multi-institutional, pre-COVID cohort of adults age 50 and older had smell and taste testing using "Sniffin' Sticks" (TDI) and "Taste Strips". The impact of GD on mood, QOL, and social interaction was assessed through visual analog scales. Subjects completed the Questionnaire of Olfactory Disorders, Patient Health Questionnaire 9, Mini-Mental State Examination (MMSE), Montreal Cognitive Assessment, and the DeJong scale of loneliness.

**Results:**

48 patients with average age of 54.7 years were enrolled. 32% of patients experienced GD on taste strip testing, and 62% experienced olfactory dysfunction (OD) on TDI. 29.5% had both GD and OD. GD and OD correlated with worsened cognitive function on MMSE

( $r=0.392$ ;  $0.05$   $p=0.018$ ;  $0.003$ ). Subjects with both GD and OD had worse MMSE than either alone ( $p=0.003$ ). Dry mouth and difficult chewing correlated with psychophysical GD ( $r=-0.37$  and  $-0.31$ ,  $p=0.10$  and  $0.37$ ). Self-reported and psychophysical taste metrics were not correlated. Self-reported GD and OD were correlated ( $r=0.46$ ,  $p=0.001$ ), as were psychophysical GD and OD ( $r = 0.394$ ,  $p=0.008$ ). GD did not correlate with other metrics.

**Conclusions:**

One-third of subjects experience GD on psychophysical testing, yet most are unaware and do not report impacts on daily life. However, GD correlates with worsened cognitive function. Taste testing may play a role in screening of early neurocognitive decline. The mechanisms behind GD and neurocognitive decline warrant further study.

11:05 am - 11:15 am

**Q&A****Rhinosinusitis Diagnosis and Associated Conditions**

*Moderators: David Jang, MD, FARS; Edward Kuan, MD, FARS; Mindy Rabinowitz, MD, FARS*

11:15 am - 11:21 am

**Increased prevalence of eosinophilic esophagitis in patients with CRS**

Arthur Wu, MD, FARS  
Increased prevalence of EOE in patients w CRS  
Arthur Wu, MD, FARS  
Jordan Simmons, MD  
David Leiman  
Sarita Patil  
Edward McCoul, MD, FARS  
Philip Chen, MD, FARS  
Dennis Tang, MD  
Edward Kuan, MD, FARS  
Elena Chang  
Cedars Sinai

**Background:**

Chronic rhinosinusitis (CRS) and eosinophilic esophagitis (EoE) are common immune-mediate inflammatory conditions that are suggested to be closely linked. A single previous study has revealed a higher prevalence of EoE exists in patients with CRS in the state of Utah. Objectives: To investigate whether the increase in prevalence of EOE in patients with CRS is broadly applicable to all patients with CRS and whether the correlation may also include those patients with chronic rhinosinusitis with nasal polyposis (CRSwNP).

**Methods:**

Quantitative data detailing the prevalence of CRS, CRSwNP and EoE was pooled from 6 large academic

## PROGRAM ABSTRACTS

institutions spread across the United States using the SlicerDicer application embedded in the Epic electronic medical record system and the Research Patient Data Registry at Massachusetts General Health Systems. One-way ANOVA was then used to analyze the data.

#### Results:

The mean prevalence of EoE in our general population sample of over 25 million individual records was 0.09% (range, 0.02 to 0.2%). The mean prevalence of EoE in our sub-populations of individual with diagnosed CRS and CRSwNP was 0.44% ( $p < 0.01$ ) and 0.72% ( $p < 0.01$ ) respectively.

#### Conclusion:

This study reveals a 5-fold greater prevalence of concurrent EoE in patients with CRS. Importantly, this is only the second study to describe this increase in prevalence, and it is the first study to describe the association of EoE and the CRSwNP subtype. We demonstrate an 8.1-fold greater prevalence of EoE present in patients with CRSwNP.

11:22 am 11:28 am

#### Inflammatory endotype of odontogenic sinusitis

John Craig, MD, FARS

Odontogenic sinusitis endotype

Xiangguo Dai, PhD

Stacey Bellemore, MS

Kimberley Woodcroft, MPH, PhD

Carl Wilson, MS

Kevin Bobbitt, PhD

Mayur Ramesh, MD

Henry Ford Health

#### Background:

Odontogenic sinusitis (ODS) is distinct from non-odontogenic rhinosinusitis with regard to clinical features as well as diagnostic and therapeutic approaches. While numerous studies have explored immune profiles of chronic rhinosinusitis, very few studies have explored the inflammatory endotype of ODS.

#### Methods:

Intraoperative maxillary sinus mucosal biopsies were obtained during endoscopic sinonasal surgery in both control and ODS patients. ODS was diagnosed by confirming infectious sinusitis adjacent to confirmed ipsilateral infectious odontogenic pathology. Controls were from patients undergoing endoscopic skull base surgery with no sinonasal disease. Specimens were snap frozen in liquid nitrogen, and stored at  $-80^{\circ}\text{C}$ . Protein cytokine analysis was performed using ELISA for Th-1 (TNF $\alpha$ , IFN $\gamma$ , IL-2,12,18,22), Th-2 (IL-4,5,9,10,13), Th-17 (IL-17A,F) and innate (CXCL9, CXCL10, IL-6,8,10,12,27) immune pathways. Groups were compared via independent sample t-tests; if assumptions were violated, nonparametric Wilcoxon ranked sum tests were performed.

#### Results:

Specimens from 22 ODS patients were compared to 9

controls. ODS was due to apical periodontitis ( $n=7$ ), or occurred either after dental extraction ( $n=12$ ) or maxillary sinus bone grafting with or without dental implantation ( $n=3$ ). The following cytokines were significantly elevated in ODS compared to controls: IFN $\gamma$ , TNF $\alpha$ , IL-6, 8, 10, 27, and CXCL9. ODS therefore demonstrated heightened innate and Th1 immune activity. IL-17 levels were similar in both control and ODS samples.

#### Conclusion:

In this pilot study, ODS demonstrated both an innate immune and increased Th1 inflammatory endotype. Further in-depth studies are needed to explore ODS immunopathobiology.

11:29 am - 11:35 am

#### Evaluation and work-up of immunodeficiencies in recurrent acute rhinosinusitis: A scoping review

Jessica Lin, AB, Medical Student

Shreya Mandava

Spencer Payne, MD, FARS

Jose Mattos, MD, MPH

University of Virginia

#### Background:

Primary immunodeficiency disorders (PID) may be a risk factor for development of Recurrent Acute Rhinosinusitis (RARS). However, there are currently no practice guidelines for when and how to order PID testing for patients with RARS. The aim of this scoping review is to identify and analyze existing literature on this topic.

#### Methods:

A scoping review was conducted according to PRISMA guidelines. Articles addressing recurrent acute sinusitis and immunodeficiencies were collected from PubMed, Web of Science and CINAHL. Included articles were systematically evaluated for eligibility by two reviewers, followed by a quality evaluation for inclusion.

#### Results:

Of the 209 unique articles identified, eleven met criteria for review and analysis. Articles consisted of either non-systematic reviews or cohort, case-control, and cross-sectional studies, with only two specifically focusing on evaluation of PID in patients presenting with RARS. The majority (10) recommended immunodeficiency testing, such as post-vaccination antibody response (6) and quantitative immunoglobulin testing (5). There was an emphasis on IgG subclass testing (6) occurring before or during primary immunodeficiency testing. Timing of testing varied, with the majority recommending testing after recurrent infections (5) or for cases refractory to treatment (2).

#### Conclusions:

Current literature on RARS emphasizes immunoglobulin quantification and post-vaccination antibody titers to evaluate for PID, but there is no consensus on timing or method of testing. This scoping review identified a lack of evidence-based articles specific to diagnostic



## PROGRAM ABSTRACTS

workup for PIDD in patients with RARS, and additional research is necessary to guide clinical practice.

11:36 am - 11:42 am

### Importance of sinus cultures in patients with acute exacerbations of CRS

Jessa Miller, MD

Hye Rhyn Chung, Medical Student

Huan Zhang, Fellow

Marilene Wang, MD, FARS

Jivianne Lee, MD, FARS

Daniel Beswick, MD, FARS

Jeffrey Suh, MD, FARS

UCLA

Introduction:

Patients with acute exacerbations of chronic rhinosinusitis (AECRS) are more likely to grow antibiotic-resistant bacteria. This study evaluates how sinus cultures and clinical decision-making affects the antibiotic regimen for AECRS.

Methods:

All patients with AECRS who presented to a single surgeon from 11/2021-1/2022 were included. Sinus cultures were taken and patients were either prescribed antibiotics immediately or were instructed to wait for culture-directed therapy. Patients were called to discuss culture results and treatment plan. Medical records were reviewed and statistical analysis was performed to determine how culture results impact management.

Results:

There were 85 discrete patients and 108 clinical encounters. Mean age was 52.3 years. 70.6% had CRSsNP and 29.4% had CRSwNP. 75% of patients were prescribed antibiotics at the initial visit. Cultures most commonly grew *S. aureus* (31.5%), *P. aeruginosa* (10.2%), and *S. maltophilia* (5.6%); 35.2% were negative. Compared to patients with CRSwNP, those with CRSsNP were more likely to grow *S. aureus* ( $p=0.01$ ). The mean time to finalized culture result was 3 days ( $SD=1.1$ ) and follow-up phone call was 4.9 days ( $SD=1.6$ ). The antibiotic regimen was correctly determined in 73% of cases and required a change in 27%. Reasons for change were inappropriate antibiotic (41.4%), no antibiotics initially prescribed (37.9%), antibiotic resistance (10.3%), and patient preference (10.3%). There was no difference in plan alteration rates among patients with CRSwNP and CRSsNP ( $p=0.6$ ).

Conclusion:

Clinic cultures altered the antibiotic regimen in 27% of cases of AECRS. Selecting the correct antibiotic for AECRS can be challenging, and cultures are useful to direct antibiotic choice.

11:43 am - 12:00 pm

### Q&A

12:00 pm – 1:00 pm

### Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Program Luncheon

Guest Speaker: Simone S. Hicks, JD

"Medical Contracts and Negotiations from a Legal Perspective"

Salon E

12:00 pm – 1:00 pm

### Lunch with Exhibitors in Franklin Hall

## Saturday, September 10, 2022

8:00 am – 2:45 pm

### Breakout D

### Salon K/L

7:00 am – 8:00 am

Meet the Authors Poster Viewing & Breakfast  
Franklin Hall

## Rhinology All Around

*Moderators: Stephanie Joe, MD, FARS; Jonathan Mallen, MD; Theodore Schuman, MD, FARS*

8:00 am - 8:06 am

### Hospital ownership status effect on nasal bone fracture outcomes and cost of care

Maham Ahmad

Mehdi Lemdani, BA

Priyanka Singh

Hannaan Choudhry, BA

Prayag Patel, Fellow

Jean Anderson Eloy, MD, FARS

Background:

Private equity-owned hospitals have become a growing component of healthcare, despite debate over their efficacy. The effect of hospital ownership on otolaryngological care has not been examined in nasal bone fracture (NBF) management. This study compares hospital ownership type to determine differences in outcomes, costs, and charges for patients receiving care primarily for NBFs.

Methods:

The 2016-2017 National Inpatient Sample (NIS) was queried for a retrospective database review of primary initial encounter NBFs. Negative binomial regressions compared cost and charges between government-controlled, private non-profit (PNP), and private for-profit hospitals (PFP), after controlling for demographics, comorbidities, patient safety indicator events (PSIs), and hospital characteristics.

Results:

2,362 (11,810 weighted) patient cases were queried.

368 (16.9%) cases received care at a government hos-

## PROGRAM ABSTRACTS

pital, 1478 (67.9%) at a private non-profit, and 330 (15.2%) at a private for-profit hospital. Negative binomial regressions showed no difference in PSI occurrence in government-controlled hospitals relative to PNP (OR 1.372, 95% CI .916–2.056,  $p=.124$ ) and PFP (OR 1.426, 95% CI .873–2.328,  $p=.156$ ). Total cost per case, relative to government-controlled hospitals, was lower for PNP (OR .901, 95% CI .851–.953,  $p<.001$ ) and PFP hospitals (OR .652, 95% CI .603–.705,  $p<.001$ ). However, total charges were highest for PFP hospitals (OR 2.491 95% CI 2.311–2.684,  $p<.001$ ), followed by PNP (OR 1.290, 95% CI 1.220–1.364,  $p<.001$ ).

#### Conclusions:

This study suggests that PFP hospitals, despite a similar quality of care, have significantly lower costs per NBF yet charge more compared to government-controlled and PNP hospitals.

8:07 am – 8:13 am

#### Clinical characteristics of patients with TMJ arthritis presenting as CRS

Norman Orabi, MD

Sahar Assi

Parker Tumlin

Mustafa Bulbul

Hassan Ramadan, MD, MSc, FARS

Chadi Makary, MD, FARS

West Virginia University School of Medicine

#### Background:

Patients with temporomandibular joint (TMJ) arthritis frequently present to a rhinology clinic due to sinus symptoms. We aim to characterize those patients using sinonasal outcomes and compare them to their counterparts with chronic rhinosinusitis.

#### Methods:

Adult patients initially presenting to a rhinology clinic from July 2020 to January 2022 were divided into three cohorts: CRS without nasal polyps (CRSsNP), CRS with nasal polyps (CRSwNP), and TMJ arthritis alone. Consensus definitions were used to make the diagnoses of each group. Groups were compared using overall SNOT-22 and subdomain scores, Lund-Kennedy (LK) endoscopy score, Lund-Mackay (LM) score, comorbidities, and other demographic factors.

#### Results:

There were 118 patients with CRSsNP, 90 patients with CRSwNP, and 46 patients with TMJ arthritis alone. Compared to CRSsNP and CRSwNP, TMJ arthritis was associated with female sex (80.4% vs 47.5 and 45.6%,  $p<0.001$ ), lower LK score (0.2 vs 4.2 and 4,  $p<0.001$ ), and lower CT score (0.5 vs 7.4 and 12.7,  $p<0.001$ ). TMJ arthritis had higher overall SNOT-22 scores (46.9 vs 36.1,  $p=0.003$ ) compared to CRSsNP and similar overall SNOT-22 scores (46.9 vs 40.30,  $p=0.91$ ) compared to CRSwNP. TMJ arthritis had lower scores in the rhinologic domain and higher scores in the ear/facial, sleep, and psychological domains (all  $p<0.05$ )

compared to both CRSsNP and CRSwNP.

#### Conclusion:

Patients with TMJ arthritis presenting with sinus complaints tend to be female and have different SNOT-22 domain scores with lower scores in the rhinologic domain and higher scores in the ear/facial, sleep, and psychological domains.

8:14 am - 8:20 am

#### A quantitative approach to measurement of nasal medication irrigation

Jeffrey Falco, Resident Physician

Aditya Devarakonda

Stilianos Kountakis, MD, PhD, FARS

Camilo Reyes, MD, FARS

Medical College of Georgia

#### Introduction:

Effective delivery of topical medication is crucial in treating chronic rhinosinusitis. While general recommendations have been published regarding irrigation distribution, no studies have quantified topical medication distribution. This study aims to perform quantitative analysis of topical medication distribution across the sinonasal cavity.

#### Methods:

Eight previously dissected cadaver heads were irrigated using a squeeze bottle with fluorescent powder simulating the standard concentration of topical corticosteroid in both 45° (red dye) and 90° (green dye) head positions. Images of the frontal, ethmoid, sphenoid, and maxillary sinuses as well as the nasopharynx and middle turbinate were acquired and quantitatively analyzed using image data software. Comparisons of percentage coverage with fluorescent powder were performed via Wilcoxon rank-sum testing.

#### Results:

There was greater percentage of coverage in the ethmoid and sphenoid sinuses when irrigation is done at 90° compared to the 45° position ( $p < 0.05$ ) with no significant difference in any other regions. In the 90° position, there was a greater percentage of medication in the frontal sinus and sphenoid sinus compared to the middle turbinate ( $p < 0.05$ ). In the 45° position, there was a greater percentage coverage in the frontal sinus than the middle turbinate and sphenoid sinus ( $p < 0.05$ ) and greater coverage in the maxillary sinus than the middle turbinate ( $p < 0.05$ ).

#### Conclusion:

The 90° position allows for significantly improved medication distribution of the ethmoid and sphenoid sinuses without compromising delivery to other paranasal sinuses.

## PROGRAM ABSTRACTS

8:21 am - 8:27 am

**Teaching sinus anatomy: efficacy of self-directed online sinonasal anatomy learning modules**

Eric Bailey, MD  
 Christopher H. Le, MD, FARS  
 Eugene Chang, MD, FARS  
 West Virginia University

**Objective:**

To evaluate self-directed sinonasal anatomy education modules

**Background:**

Sinonasal anatomy is complex. While mastery requires repeated exposure, self-paced educational modules focused on spatial anatomy, surgical landmarks, and clinical relevance could introduce trainees to sinonasal anatomy and serve a tool for on-demand education.

**Methods:**

Multicenter, randomized IRB-approved educational trial; Medical students [MS] (n=43) and otolaryngology residents (n=40) completed pre-intervention sinonasal anatomy assessment (score range 0-15). Subjects were randomized to educational module utilizing CT images or mixed media (CT images and endoscopic surgical video). Content and audio narration were identical. Subjects completed post-intervention assessment.

**Results:**

MS demonstrated higher post-intervention scores after either CT or mixed media modules ( $p < .01$  for both pre/post-intervention comparisons). Average increase in score for residents randomized to mixed media module also trended toward significance. MS felt that inclusion of endoscopic video was helpful for understanding 3-D anatomic relationships but was challenging for novice learners. Residents scored higher ( $p < 0.01$ ) on pre-intervention and post-intervention assessments than MS post-intervention averages.

**Conclusion:**

A 10-minute educational module incorporating CT imaging or mixed media can improve medical student sinonasal anatomy knowledge. Residents scored higher than MS before or after educational intervention, suggesting repeated exposure to anatomy is necessary. Self-directed modules allow students to review material at will. Future trials should determine whether repeated exposure can improve recall and consolidation of anatomy knowledge.

8:28 am - 8:34 am

**Feedback improves E/M billing**

Amarbir S. Gill, MD  
 Dennis Menjivar  
 Marc Error  
 Paige Shipman  
 Jorgen Sumsion, BS  
 Jeremiah Alt, MD, PhD, FARS  
 University of Utah Health

**Introduction:**

Discrepancies in medical coding can negatively impact institutional revenue and result in accusations of medical fraud. The objective of the present study was to prospectively assess the utility of a dynamic feedback system for otolaryngology providers on improving coding/billing accuracy of outpatient clinic encounters.

**Methods:**

A billing audit of outpatient rhinology clinic visits was performed after the introduction of the 2021 Medicare E/M guidelines. Dynamic billing/coding feedback, consisting of a virtual lecture and targeted e-mails, was provided at distinct intervals, over one year. Medicare work relative value units (wRVU) assignments for each current procedural (CPT) code were used to calculate wRVU lost due to coding errors. Chi square was used for categorical data and the Wilcoxon test was used to compare change in accuracy over time.

**Results:**

A total of 176 clinic encounters were reviewed. Prior to feedback, 60% of encounters were inaccurately billed by otolaryngology providers, requiring upcoding and representing a potential 35% wRVU loss of E/M generated productivity. After 1 year of feedback/education, providers significantly increased the accuracy of their billing from 40% to 70% (OR 3.55,  $p < 0.001$ , 95% CI: 1.69, 7.29), with a corresponding decrease in potential wRVU loss from 35% to 10% (OR 4.87,  $p < 0.001$ , 95% CI: 0.81, 10.51). Providers increased incorporation of both medical decision making (MDM) and time as billing elements, as opposed to relying purely on MDM.

**Conclusion:**

Dynamic billing feedback significantly improved outpatient E/M coding among otolaryngology healthcare providers, resulting in a significant decrease in potential revenue loss.

8:35 am - 8:45 am

**Q&A**

## PROGRAM ABSTRACTS

8:45 am - 9:25 am

**Panel: Moving rhinology forward – high impact rhinology research**

Moderator: Stephanie Shintani-Smith, MD  
 Panelists: Benjamin Bleier, MD, FARS; Murray Ramanathan, MD, FARS; Bruce Tan, MD

**Cerebrospinal Fluid Leaks and Biomarkers**

*Moderators: Edward El Rassi, MD; Tran Locke, MD; Sonya Marcus, MD*

9:25 am - 9:31 am

**Assessment of CSF biomarkers for cognitive impairment in patients with sinonasal inflammation**

Nathaniel Reeve, MD  
 Laura de Lima Xavier, Neurology Resident  
 Aria Jafari  
 David Cvancara, Medical student  
 Thomas Marshall, Medical student  
 Waleed Abuzeid  
 Ian Humphreys,  
 Ashton Lehmann  
 University of Washington

**Background:**

Chronic rhinosinusitis (CRS) may be a risk factor for irreversible progressive forms of cognitive impairment seen in dementia. Although the underlying mechanism is unknown, potential pathophysiologic explanations include decreased oxygenation, increased inflammation, and altered nasal microbiome. Furthermore, CRS may influence the levels of Amyloid $\beta$  (A $\beta$ ) and Tau proteins, known biomarkers for neurodegeneration in conditions of cognitive impairment. This study sought to investigate the connection between sinonasal inflammation and cognitive impairment through cerebrospinal fluid (CSF) protein analysis.

**Methods:**

In this case-control study, we analyzed CSF levels of A $\beta$  and Tau proteins and MRI images of healthy controls included in our institution's Alzheimer's Disease Research Center database. Ten patients were selected with MRI findings of sinonasal inflammation based on Lund-Mackay scores  $\geq 4$ . Ten age- and gender-matched patients without sinonasal inflammation served as controls. The levels of A $\beta$ 40, A $\beta$ 42, total Tau (T-tau) and P-tau181 and biomarker ratios (i.e., T-tau/A $\beta$ 42, P-tau181/A $\beta$ 42 and A $\beta$ 42/40) were compared between groups with T tests.

**Results:**

There were no significant differences in CSF biomarker levels or ratios between patients with sinonasal inflammation and controls.

**Conclusions:**

Patients with and without sinonasal inflammation had similar levels and ratios of CSF biomarkers for neuro-

degeneration. Although further study is needed to confirm and expand on these findings, these results suggest that the connection between cognitive impairment and CRS may result from a pathophysiologic process distinct from A $\beta$  and Tau protein-mediated neurodegeneration.

9:32 am - 9:38 am

**Optic nerve sheath diameter correlates to intracranial pressure in spontaneous CSF leak patients**

Ashwini Tilak  
 Lydia Chang, BS  
 Jake Morgan, MD  
 Maxwell Thompson, MD  
 Samuel Burleson, MD  
 Amanda Atkins, MD  
 Delaney Sheehan, MD  
 Do-Yeon Cho, MD  
 Bradford Woodworth, MD, FARS  
 UAB

**Background:**

Spontaneous cerebrospinal fluid (sCSF) leaks develop from chronic pressure erosion due to idiopathic intracranial hypertension (IIH). Treatment of IIH is paramount to prevent sCSF leak recurrence. Direct measurements of intracranial pressure through lumbar puncture, lumbar drain, or ventriculostomy are invasive and associated with risks. The objectives of this study are to determine whether ultrasonographic measurements of the optic nerve sheath diameter (ONSD) correlate with LD ICP in patients with sCSF leaks undergoing treatment and whether ONSD widths are larger in patients with sCSF leaks than controls.

**Methods:**

Subjects with sCSF leaks and controls with benign conditions were prospectively recruited/consented for ONSD ultrasonography. ONSD, gender, and body mass index (BMI) were compared. For sCSF leak subjects, ultrasonography was performed at the time of LD opening pressure and each pressure check postoperatively, including response to acetazolamide. Correlation between ONSD and ICP was performed.

**Results:**

Subjects with sCSF leaks (n=9, age  $52.4 \pm 8.9$ , all female) and controls (n=8, age  $60.1 \pm 13.8$ , 2 females) had significantly different BMIs ( $38.4 \pm 8.1$ , vs.  $29.2 \pm 4.8$ ,  $t(15)=2.793$ ,  $p=0.014$ ). ONSD was strongly correlated with LP measurements ( $r=0.593$ ,  $p=0.002$ ). Percent change in ONSD and LP measurement were more strongly correlated ( $r=0.726$ ,  $p<0.001$ ). Patients with sCSF leaks had significantly higher ONSD than controls ( $0.63\text{cm} \pm 0.044$ , vs.  $0.56\text{cm} \pm 0.075$ ,  $t(15)=2.265$ ,  $p=0.039$ ).

**Conclusion:**

ONSD significantly correlated with ICP in sCSF leak patients and was wider in sCSF leak subjects than controls. Ultrasonography has utility in monitoring the long term ICP response to acetazolamide.

## PROGRAM ABSTRACTS

9:39 am - 9:45 am

**Multi-institutional spontaneous CSF leak case-control study**

Pedro Escobedo, BS  
 Peter Filip, MD  
 Sarah Khalife, MD  
 Ali Baird, BS  
 Lorenzo Munoz, MD  
 Richard Crowley, MD  
 Raj Shrivastava, MD  
 Jaymarc Lloreta, MD  
 Peter Papagiannopoulos, MD  
 Bobby Tajudeen, MD  
 Pete Batra, MD, FARS  
 Rush Medical College

**Introduction:**

While the etiology of spontaneous cerebrospinal fluid (CSF) rhinorrhea and otorrhea is unclear, evidence suggests that this may be secondary to idiopathic intracranial hypertension (IIH). The existence of multiple, concurrent skull base defects (SBD) and associated synchronous CSF leaks in this population has been previously explored in a retrospective fashion at a single institution. We present a multi-institution case-control study with a goal of highlighting potential CSF leak risk factors.

**Methods:**

A multi-institutional retrospective review of patients was conducted over a 10-year period with spontaneous CSF leak patients selected as cases and non-CSF leak IIH patients as controls. Odds ratios were employed to measure potential relationships between spontaneous CSF leaks, multiple SBD, preoperative imaging, and perioperative variables.

**Results:**

192 patients, including 84 case subjects and 104 control subjects, were analyzed. Mean age of the adult cohort was  $44.4 \pm 14.3$  years with a mean BMI of  $38.2 + 8.6$ . A significant association was measured between CSF leak cases with a single SBD (OR: 23.8; [95% CI 8.8-64.3]) and multiple SBD (OR: 92.7; [95% CI 12.4-695.7]). Conversely, case subjects had a decreased association with clinical symptoms including tinnitus (OR: .28; [95% CI .15-.51]), headaches (OR: .06; [95% CI .02-.20]), papilledema (OR: .05; [95% CI .02-.12]), and visual field defects (OR: .10; [95% CI .05-.21]).

**Conclusions:**

Multiple SBDs and encephaloceles are a common and likely under-appreciated finding, potentially serving as independent risk factors for spontaneous CSF leaks. Preoperative imaging must be thoroughly reviewed for secondary defects as these are important risk factors.

9:45 am - 9:51 am

**Subjective symptoms and signs of postoperative cerebrospinal fluid leak**

Jonathan Pang, BA

Cecilia Nguyen, BS  
 Dean Chung, BA  
 Arash Abiri, BS  
 Frank Hsu, MD, PhD  
 Edward Kuan, MD, FARS  
 University of California, Irvine

**Background:**

Postoperative cerebrospinal fluid (CSF) leak remains a concerning complication of the endoscopic endonasal approach (EEA) for skull base pathology. Nonspecific symptoms and signs suggesting CSF leak may be reported during the postoperative course, which may challenge even the most experienced of clinicians. In this study, we systematically evaluate associations between commonly reported signs/symptoms and the incidence of postoperative CSF leaks.

**Methods:**

Retrospective chart review was conducted at a tertiary academic medical center including consecutive patients with intraoperative CSF leak during EEA with primary repair between July 2018 and October 2021. Postoperative CSF leak incidence was calculated and compared to all descriptions of symptoms and signs concerning for CSF leak noted by nursing and surgical services.

**Results:**

Of 104 patients, 59 (56.7%) had high-flow leaks repaired and 3 (2.9%) developed CSF leaks postoperatively. Complaints of rhinorrhea (63.4% vs 36.6%,  $p=0.027$ ), throat drainage (86.0% vs 14.0%,  $p=0.029$ ), and nausea/vomiting (63.0% vs 37.0%,  $p=0.012$ ) were more commonly reported in patients with intraoperative high-flow leaks. Rhinorrhea ( $p=0.352$ ), throat drainage ( $p=0.062$ ), nausea/vomiting ( $p=0.609$ ), headaches ( $p=0.290$ ), and a salty/metallic taste ( $p=0.344$ ) were not found to be associated with postoperative CSF leak. Lack of nasoseptal flap enhancement on MRI ( $p=0.487$ ) was not associated with postoperative CSF leak. No signs/symptoms independently predicted postoperative CSF leak upon multivariable analysis.

**Conclusion:**

A range of subjectively reported symptoms and signs failed to predict postoperative CSF leak. Further investigation is warranted to inform appropriate attention and response.

9:51 am - 10:00 am

**Q&A**

10:00 am - 10:30 am

**Break with Exhibitors in Franklin Hall**



## PROGRAM ABSTRACTS

10:30 am - 11:15 am

**Panel: ARS society structure – how to get involved!**

Moderator: Joshua Levy, MD, FARS

Panelists: Amber Luong, MD, PhD, FARS; Brent Senior, MD, FARS; Timothy Smith, MD, FARS; Michael Stewart, MD, FARS

**Basic and Translational Science***Moderators: Naveen Bhandarkar, MD, FARS; Do-Yeon Cho, MD; Esther Kim, MD*

11:15 am - 11:21 am

**Interferon-induced olfactory mucosal inflammation elicits an immune response in the olfactory bulb**

Andrew Lane, MD, FARS

Wenjuan Shen

Mengfei Chen

Amy Smith

Heather Kulaga

Johns Hopkins School of Medicine

**Background:**

Interferon-gamma (IFN-g) is a pleotropic cytokine that directly inhibits viral replication and has immunomodulatory and immunostimulatory functions including macrophage activation and induction of MHC class II molecules. IFN-g expression in the olfactory epithelium (OE) has been shown to cause a lymphocytic infiltrate and significantly decreased odorant responses. In this study, we explored whether IFN-g-mediated inflammation induced specifically in the nasal OE elicits an immune response in the olfactory bulb (OB).

**Methods:**

A transgenic mouse model was used to inducibly drive expression of IFN-g by olfactory sustentacular cells. After 6 weeks of OE IFN-g-expression, immunostaining was performed to determine the number OB microglia and their activation state. In addition, differential expression of immune signaling molecules relevant to IFN-g responses was quantified by qPCR.

**Results:**

Compared to control mice, Iba1 immunostaining in IFN-g-induced OE inflammation mice demonstrated increased microgliosis in all layers in the OB. qPCR analysis showed significant increases in mRNA expression of IL-6, STAT1, H2-Aa, and class II MHC transactivator in the IFN-g OE inflammation mice, as well as decreased expression of IL-10.

**Conclusions:**

IFN-g-mediated inflammation induced locally in the mouse OE can spread to the OB, resulting in microgliosis and IFN immune pathway gene expression. The transmission of inflammatory signals from the nasal olfactory mucosa to the brain is not understood mechanistically, but is potentially relevant to neurological sequela of respiratory viral infection as well as the

pathogenesis of neurodegenerative diseases involving olfactory dysfunction.

11:22 am - 11:28 am

**Simvastatin as a topical anti-inflammatory**

Nyssa Farrell, MD

Steven Brody

Jay Piccirillo, MD

Tao Huang

Jiehong Pan

Washington University in St. Louis

**Introduction:**

Simvastatin has pleiotropic effects on inflammation, oxidative stress, and neuroprotection and may have applications for sinonasal inflammation. Its utility is limited by low bioavailability when enterally administered. Intranasal drug administration may serve as an option for administration of simvastatin. Accordingly, we examined the in vitro effects of simvastatin suspension on human airway epithelial cells, in an effort to determine its utility as a topical therapy for sinonasal disease.

**Methods:**

Simvastatin suspensions, ranging 1-100 uM, were applied to tracheobronchial epithelial cells (hTECs) grown at an air-liquid interface. Drug was applied for 5 min daily for 4 days. Each exposure was followed by rinsing the cell surface. The ciliary beat frequency (CBF), transepithelial resistance (TEER), and cellular viability were evaluated at time 0 and after 4 days of drug exposure. Cells were immunostained for cilia using an antibody to acetylated alpha tubulin and cell junctions using an antibody to E-cadherin to assess cilia and cell junction integrity, respectively. LDH was measured in the basal media.

**Results:**

Simvastatin suspensions 1-100 uM did not impact CBF. Suspensions of simvastatin 1-10 uM did not impact TEER, but a decrease was noted at higher concentrations (50 and 100 uM), accompanied by some loss of E-cadherin. There was no significant change in LDH after 4 days of drug exposure.

**Conclusion:**

Low concentration simvastatin irrigations appear safe for topical use on airway epithelium. Higher concentrations (50 and 100 uM) may result in some cellular changes, though significant toxicity was not noted. Additional studies should be performed to evaluate the utility of simvastatin suspensions.

11:29 am - 11:35 am

**Impact of topical probiotics on differentiated human nasal epithelial cell function and viability**

Juliana Theorell, MD/PhD candidate

Natalia Obacz

Minxiu Wang, PhD

Victoria Lee, MD, FARS

Omar Perez, PharmD, PhD

## PROGRAM ABSTRACTS

**Introduction:**

Recent studies have noted significantly reduced microbial diversity in the sinus microbiome in individuals with CRS compared to healthy subjects. Furthermore, *Lactobacillus sakei* (*L. sakei*) was identified as a largely protective species for the sinonasal microbiome, making it the ideal candidate to trial topical probiotic intervention for individuals with CRS. This study investigated the impact of topical *L. sakei* on differentiated human nasal epithelial cell (HNEC) viability and mucosal barrier function to inform a future clinical trial.

**Methods:**

A range of concentrations of *L. sakei* topical solution was applied for 30 minutes to differentiated HNECs. Mucosal barrier function was assessed through transepithelial electrical resistance (TEER), paracellular permeability assay, and immunofluorescent staining of tight junction protein ZO-1. Cytotoxicity was assessed through lactate dehydrogenase assay.

**Results:**

Compared to control medium,  $4.2 \times 10^6$  CFU/mL and  $1.5 \times 10^8$  CFU/mL of topical *L. sakei* probiotic had no significant decrease in TEER, increase in paracellular permeability, or decrease in expression of tight junction ZO-1 protein in HNECs, suggesting intact mucosal barrier function. Compared to control medium, these concentrations were not cytotoxic.

**Conclusions:**

Topical *L. sakei* probiotic exposure to HNECs for up to 30 minutes did not affect mucosal barrier function and was not cytotoxic. These in vitro results support the safety of clinically trialing topical *L. sakei* at the tested concentrations in individuals with CRS to restore the sinonasal microbiome.

11:36 am - 11:42 am

**Host immune response differences to fungus in healthy subjects and sinus mycetoma patients**

Estephania Candelo, MD, MSc  
Angela Donaldson, MD, FARS  
Osarenoma Olomu, Rhinology and Skull base Consultant  
Mayo Clinic

Sinus mycetoma (SM) is part of the non-invasive fungal rhinosinusitis spectrum. However, the microbiome of SM and healthy controls have similar fungal species. The difference between health and disease may be related to the host response. We hypothesized that a proteomic approach may show these host response differences, and better explain the pathogenicity of SM. A mass spectroscopy-based shotgun proteomics assay was used to evaluate the protein content of SM. We compared the proteome of the sinus contents from 3 patients with SM and 3 healthy controls. A total of 2123 proteins were screened and analyzed using a two-way ANOVA test. 43 proteins were found to be present in a statistically significant quantity in SM compared to con-

trols. These proteins were further evaluated using unique pathway software, STRINGv1 and REACTOME. There are significant proteomic differences between SM and healthy controls. A high content of proteins such as myeloperoxidase, eosinophil peroxidase, and keratin were identified. A significant reduction in proteins associated with antigen response, complement cascade, and phagosome pathways were noted in the SM group. Our analysis found that SM has unique pathways involved in the activation of the innate immune system especially events related to neutrophil degranulation, Toll-like receptor signaling, and phagocytotic activity associated with granulomas. Mycetoma proteome shows a high content of proteins related to the innate immune system and the development of granulomatous disorders. Reduced content of proteins involved in antigen clearance was recognized in SM. These results might explain the localized, encapsulated, and non-invasive pathogenesis of SM.

11:43 am - 12:00 pm

**Q&A**

12:00 pm - 1:00 pm

**Lunch with Exhibitors in Franklin Hall**

12:00 pm – 1:00 pm

**Women in Rhinology/Diversity & Inclusion/ Mentorship/Residents and Fellows Program Luncheon**

Guest Speaker: Simone S. Hicks, JD  
“Medical Contracts and Negotiations from a Legal Perspective”  
Salon E

1:00 pm - 1:45 pm

**Panel: Cough -- where does the rhinologist fit in?**

Moderator: Abtin Tabaei, MD, FARS  
Panelists: John Bosso, MD; Rakesh Chandra, MD, FARS; Patricia Loftus, MD, FARS; Anais Rameau, MD

1:45 pm - 2:00 pm

**HOT TOPICS: Central compartment atopic disease: recent evidence, knowledge gaps, future understanding**

Speaker: John Del Gaudio, MD, FARS

## PROGRAM ABSTRACTS

**Health Disparities, Disease Burden, and Patient Outcomes**

*Moderators: Regan Bergmark, MD, FARS; Victoria Lee, MD; Elina Toskala, MD, FARS*

2:00 pm - 2:06 pm

**Health disparities among adults with sinusitis in the United States**

Eric Wei, MD  
Gun Min Youn  
Jay Shah  
Zara Patel, MD, FARS

**Background:**

Sinusitis is a common condition which can significantly decrease quality of life, with treatment delay linked to worsened upper and lower respiratory outcomes and rarely, significant complications. We aimed to explore disparities in ability to access appropriate and timely care among adults with sinusitis based on sociodemographic factors.

**Methods:**

Of 32,981 adults completing the 2016 National Health Interview Survey (NHIS), 4,014 were diagnosed with sinusitis at least once within the preceding 12 months. Self-reported measures of healthcare access and utilization were analyzed.

**Results:**

Asian race was associated with an over 5-fold odds of delaying care due to having to wait too long to see a doctor (OR 5.3, 95% CI 2.1, 13.0). Asian race was associated with decreased odds of taking less medicine to save money (OR 0.08, 95% CI 0.01, 0.60) while Hispanic ethnicity was borderline associated (OR 1.75, 95% CI 0.96, 3.20;  $p = 0.068$ ) with increased odds of taking less medicine to save money. Both Asian race and Hispanic ethnicity were significantly associated with increased odds of obtaining medications from another country to save money. Individuals with public insurance had decreased odds of delaying care or not receiving care due to cost, but increased odds of delaying care due to transportation issues. Individuals who were uninsured and individuals in lower-income groups had increased odds of not receiving care due to cost and delaying care due to a lack of transportation or affordability.

**Conclusions:**

Significant disparities in healthcare access based on race, health insurance status, and income exist among adults with sinusitis in the United States.

2:07 pm - 2:13 pm

**The impact of priming on rhinologic patient reported outcome measures**

Nathan Yang, MD, MSc, FRCSC  
Zachary Soler, MD, FARS  
Jonathan Overvest, MD, PhD  
Adam Waytz  
David Gudis, MD, FARS

**Introduction:**

Patient-reported outcome measures (PROMs) are validated questionnaires used to assess the subjective experience of illness. Priming is a phenomenon wherein exposure to a stimulus influences how a person responds to a subsequent stimulus. We recently demonstrated in a prospective randomized controlled trial (RCT) that responses to the SNOT-22 can be significantly impacted by priming subjects with unrelated questionnaires. The objective of this RCT is to determine if responses to the Rhinosinusitis Disability Index (RSDI) and the mini-Rhinoconjunctivitis Quality of Life Questionnaire (mini-RQLQ) can be similarly influenced by priming.

**Methodology:**

A prospective RCT with 600 adults was conducted. Participants were randomized to one of six groups. Groups A and D were primed positively prior to completing the RSDI and the mini-RQLQ, respectively. Groups B and E were primed negatively prior to completing the RSDI and mini-RQLQ. Groups C and F completed the PROMs without priming.

**Results:**

RSDI responses after negative priming (63.4, 95%CI[59.0-67.8]) were statistically significantly worse ( $p < 0.001$ ) than after positive priming (49.2, 95%CI[45.2-53.1]) and the control group (47.2, 95%CI[43.4-51.0]). Mini-RQLQ responses after negative priming (24.8, 95%CI[21.1-28.5]) were also significantly worse ( $p = 0.002$ ) than after positive priming (17.3, 95%CI[14.5-20.1]) and the control group (18.6, 95%CI[15.6-21.5]). There was no significant difference in scores between the positive priming and control group for either PROM.

**Conclusion:**

Priming participants significantly impacts their responses to the RSDI and RQLQ. Specific conditions may be required in which to administer and interpret PROMs fundamental to rhinology practice.

## PROGRAM ABSTRACTS

2:14 pm - 2:20 pm

**Correlation between SNOT-22 and cardinal symptom composite scores in CRS**

Brent Senior, MD, FARS  
 Allison Gartung, PhD  
 Robert Kern, MD, FARS  
 Anders Cervin, MD, PhD  
 Joanne Rimmer, A/Prof  
 Agnieszka Wrobel  
 Lindsay Brayton, Clinical Project Manager  
 James Shao  
 Vineeta Belanger, SVP Clinical Affairs

**Background:**

LYR-210 is an implantable matrix providing 24 weeks of local sinonasal treatment with mometasone furoate for chronic rhinosinusitis (CRS). LYR-210 demonstrated clinically meaningful improvement in 22-item sinonasal outcome test (SNOT-22) and 3 cardinal symptom composite (3CS) scores at week 24 in the LANTERN study. This work evaluates the correlation between SNOT-22 and 3CS at week 24.

**Methods:**

Adult CRS subjects who failed previous medical management enrolled in a multicenter, blinded, randomized, controlled LANTERN study, and received bilateral administration of LYR-210 (7500µg) (N=21) or LYR-210 (2500µg) (N=23) or sham-procedure control (N=23). Correlation between change in SNOT-22 and 3CS (nasal blockage, nasal discharge, and facial pain) at week 24 was evaluated using Pearson and Spearman methods and a simple linear regression model. Proportion of subjects with a ≥1-point/2-point improvement in 3CS at week 24 was compared between each LYR-210 dose and control using Fisher's exact test at a 1-sided significance level of 0.05.

**Results:**

Change in SNOT-22 and 3CS at week 24 were strongly ( $r=0.76$ ) and significantly ( $p<0.0001$ ) correlated. At week 24, subjects with a 1-point improvement in 3CS were expected to have an 8.2-point improvement in SNOT-22. Compared to control, significantly ( $p<0.01$ ) higher percentages of LYR-210 (7500µg)-treated subjects improved ≥1 point (100% vs. 65%) or ≥2 points (90% vs. 43%) in 3CS at week 24. The 3CS response appeared to be dose dependent.

**Conclusions:**

LYR-210 (7500µg) demonstrated benefit in SNOT-22 and 3CS at week 24. As 3CS strongly correlates with SNOT-22, it may be a clinically relevant assessment of CRS symptoms.

2:21 pm - 2:27pm

**Chronic rhinosinusitis productivity and activity impairment**

Vivek Pandurangi, MD  
 Jess Mace, MPH  
 Peter Kim, Rhinology Fellow  
 Mathew Geltzeiler, MD, FARS  
 Kara Detwiler, MD, FARS  
 Zachary Soler, MD, FARS  
 Rodney Schlosser, MD, FARS  
 Jeremiah Alt, MD, PhD, FARS  
 Vijay Ramakrishnan, MD  
 Jose Mattos, MD, MPH  
 Timothy Smith, MD, MPH, FARS  
 Oregon Health & Science University

**Background:**

Productivity loss and activity limitations due to chronic rhinosinusitis (CRS) are known to contribute to the significant economic and personal burden of disease. The purpose of this study was to evaluate work and activity impairment before and after endoscopic sinus surgery (ESS) for medically refractory CRS.

**Methods:**

Prospective, multi-institutional, observational cohort study. Patients diagnosed with medically refractory CRS completed the Work Productivity and Activity Impairment Specific Health Problem (WPAI-SHP) questionnaire before surgery and approximately 6-months post-procedure. Factors associated with minimal clinically important differences (MCID) for productivity and activity impairment were identified.

**Results:**

A total of 279 study participants were screened for inclusion, of which 176 (63.1%) with postoperative follow-up were included in the final cohort. Preoperative productivity and activity impairment were described in 63.2% and 69.8% of patients, respectively. Among those patients, postoperative improvement equaling at least one MCID was reported in both productivity (76.1%) and activity (76.4%) impairment. Multivariate regression identified sphenoidotomy (odds ratio [OR]=4.18, 95% CI:1.03-17.02) as the only factor associated with increased likelihood of productivity improvement, whereas septoplasty during ESS (OR=8.45, 95% CI:2.33-30.68) and migraine (OR=0.35; 95% CI:0.12-0.96) were associated with differential odds of activity improvement.

**Conclusions:**

CRS is associated with a substantial burden on productivity and activity that significantly improves after treatment with ESS. These data may facilitate improved patient counseling and shared-decision making regarding surgical management for CRS.

## PROGRAM ABSTRACTS

2:28 pm - 2:34 pm

**Validation of the novel postoperative polyp scale (POPS)**

Arthur Wu, MD, FARS  
 Akaber Halawi, Assistant Professor  
 Dennis Tang, MD  
 Edward Kuan, MD, FARS  
 Philip Chen, MD, FARS  
 Elisa Illing, MD, FARS  
 Jonathan Ting, MD, FARS  
 Sanjeet Rangarajan, MD, FARS  
 Daniel Norez, MPH  
 Thomas Higgins, MD, FARS  
 Cedars Sinai

**Background:**

Commonly used endoscopic grading scales such as nasal polyp scale (NPS) poorly describe the degree of polyposis found postoperatively in the paranasal sinus cavities. The Postoperative Polyp Scale (POPS) is a novel grading system that more accurately characterizes polyp recurrence in postoperative sinus cavities. The purpose of this study was to validate and compare the POPS to the NPS.

**Methods:**

Postoperative endoscopy videos from 52 patients with CRSwNP were reviewed by 8 fellowship-trained rhinologists and scored according to both POPS and NPS. Videos were rated again 1 month later by the same reviewers, and scores were assessed for test-retest and inter-rater reliability. Spearman rank correlation was used to determine correlation of the POPS to the NPS at each rating.

**Results:**

Overall inter-rater reliability for the first and second reviews of the 52 videos was  $K_f=0.49$  (95% CI 0.42-0.57) and  $K_f=0.50$  (95% CI 0.42-0.57) for the POPS and  $K_f=0.50$  (95% CI 0.42-0.58) and  $K_f=0.38$  (95% CI 0.30-0.47) for the NPS. Intra-rater reliability showed near-perfect test-retest reliability for the POPS with  $K_f=0.80$  (95% CI 0.76-0.84) and also good test-retest reliability for the NPS with  $K_f=0.72$  (95% CI 0.67-0.77). There was very strong correlation between the two scoring systems ( $r_s=0.97$ ,  $p<0.001$ ).

**Conclusion:**

The POPS is a novel objective endoscopic grading scale that more accurately describes polyp recurrence in the postoperative state which will be useful in the future for measuring efficacy of various medical and surgical interventions. This study is also the first validation study of the commonly used NPS. Both scales have excellent test-retest and inter-rater reliability comparable with other commonly used endoscopy scale.

2:35 pm - 2:45 pm

**Q&A**

2:45 pm - 3:15 pm

**Break with Exhibitors in Franklin Hall****Saturday, September 10, 2022**

3:15 pm – 5:00 pm

**General Session****Salon H/I/J**

3:15 pm - 3:25 pm

**Business Meeting & Presidential Citations**

Michael Stewart, MD, FARS; Rodney Schlosser, MD, FARS

3:25 pm - 3:30 pm

**Introduction of Hwang Family Lectureship**

Peter Hwang, MD, FARS

3:30 pm - 4:15 pm

**Hwang Family Lectureship**

Guest Speaker: James Stankiewicz, MD, FARS  
 "Mentorship...It Goes Both Ways"

4:15 pm - 5:00 pm

**ARS/AOA Panel – The Future of Rhinology**

Moderator: Jennifer Villwock, MD

Panelists: Dana Crosby, MD, FARS; Sandra Lin, MD, FARS; Anju Peters, MD; James Stankiewicz, MD, FARS

**Meeting Adjourns**



## POSTERS

## POSTERS

Poster #001

**Adjuvant chemoradiation therapy following surgical resection of sinonasal malignancies**

Lena Kheir, BA  
 Prayag Patel, MD  
 Jean Anderson Eloy, MD, FARS  
 Rutgers New Jersey Medical School

## Objective:

To investigate survival in patients with primary sinonasal malignancies who have undergone surgical resection with adjuvant radiotherapy (AR), chemotherapy (CT), and chemoradiotherapy (CRT).

## Study Design:

Retrospective database review.

## Methods:

The 2004-2016 National Cancer Database (NCDB) was queried for cases of surgically- resected primary malignancies. Kaplan-Meier survival analysis and Cox Proportional Hazards Modelling were used to analyze the impact of AR, CT, and CRT on survival following surgery.

## Results:

616 cases treated with resection were identified, 131 (21.3%) of which received no additional therapy. 230 (37.3%) received AT, 219 (35.6%) received CRT, 20 (3.2%) received CT, and 16 (2.6%) had unknown treatment. There was no significant difference in sex, race, or age across treatment groups. Kaplan Meier analyses demonstrated significantly higher overall 5-year survival with AR in clinical AJCC T1 disease (65.7%;  $p=0.050$ ); CRT in cT2 disease (71.9%;  $p=0.008$ ); no significant difference in cT3 disease; and a survival benefit with CRT in cT4 disease (48.4%;  $p<0.001$ ). cT1-staged tumors originating in the nasal cavity had the highest survival compared to those in the ethmoid sinus (66.5% vs. <0.1%, respectively;  $p=0.030$ ). All other T stages had similar outcomes based on primary site. Finally, when stratifying for cN stage, there was a survival benefit with CRT in N0 disease (51.6%;  $p= 0.002$ ).

## Conclusions:

AR may provide a survival benefit in patients with resected sinonasal malignancies with T1 disease. CRT may provide a survival benefit in cT2, cT4 and cN0 disease. cT1 malignancies originating in the nasal cavity had the highest survival, while those originating in the ethmoid sinus had the lowest.

Poster #002

**Adoption of posterior nasal nerve cryoablation as a treatment for rhinitis**

Allan Wang  
 Peter Hwang, MD, FARS  
 Christopher Low, MD

Rhinitis can have a significant impact on a patient's quality of life. Posterior nasal nerve cryoablation was introduced as a new treatment modality for rhinitis in February 2017. It is not yet known what impact this new therapy has had on overall treatment rates for rhinitis.

A retrospective study was performed using insurance claims data from the Clinformatics™ Data Mart Database. Patients who received treatment for rhinitis during the years 2015 to 2021 were identified. Corresponding demographic and geographic data as well as rates of medical and surgical treatment for these patients were collected.

Total rates of medical prescribing of ipratropium nasal spray, posterior nasal nerve cryoablation and vidian neurectomy for rhinitis steadily increased from 1.5% of patients with rhinitis in 2015-2016 to 2.9% in 2020-2021. Approximately 80% of cryoablation procedures were performed in the office setting, a rate that remained relatively stable over time. Compared to patients who did not receive treatment with cryoablation, patients receiving cryoablation were likely to be of older age (aOR 1.031,  $p<0.001$ ), male (aOR 1.53,  $p<0.001$ ), and less likely to be from Western states (aOR 0.75,  $p<0.001$ ), from low income (aOR 0.63,  $p<0.001$ ) or rural (aOR 0.75,  $p<0.001$ ) areas.

This study shows increasing rates of medical and surgical treatment of rhinitis over time. This may reflect the impact that the introduction of a novel therapy can have in changing established treatment patterns for a disorder.

## POSTERS

Poster #003

**Adverse events following endoscopic sinonasal surgery**

Ariel Omiunu

Mehdi Lemdani, BA

Sharwani Kota

Jean Anderson Eloy, MD, FARS

Christina Fang, MD

**Objective:**

The advent of powered surgical instrumentation has shaped the field of endoscopic sinonasal surgery (ESNS) since its introduction over two decades ago. This study examines a national database for adverse events (AEs) related to the use of drills, burs, and microdebridgers during ESNS.

**Methods:**

Retrospective cross-section analysis of the Manufacturer and User Facility Device Experience (MAUDE) database for reported AEs associated with drills, burs, and microdebridgers during ESNS procedures from 2010 to 2021.

**Results:**

A total of 298 AEs were reported, and most frequently involved the use of burs compared to drills or microdebridgers (n=237, 79.5%; n=10, 3.4%; n=51, 17.1%, respectively). AEs were categorized as: device-related (n=262, 87.9%), patient-related (n=35, 11.7%), and packaging-related (n=1, 0.3%). The most common reported device-related complications were material fragmentation (n=52, 17.4%), vibrations (n=48, 16.1%), and overheating of device (n=45, 15.1%). The most common reported patient-related complications were burns (n=13, 4.4%), foreign body in patient (n=7, 2.3%), and abrasions (n=4, 1.3%). Major events, defined as emergency treatment, hospitalization and/or surgical intervention occurred in 13 (4.4%) cases, and included cerebrospinal fluid leaks (n=2) and orbital dehiscence (n=1). The highest number of AEs were reported during 2021 (n=55, 18.5%) and 2019 (n=54, 18.1%).

**Conclusion:**

The most common AEs associated with the use of powered instruments in ESNS included material fragmentation, vibrations, overheating, and burns. Healthcare providers may benefit from understanding the scope of AEs related to use of these instruments.

Poster #004

**Age in acute rhinosinusitis**

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Keshav D. Kumar, Medical Student

Prayag Patel, Fellow

Jean Anderson Eloy, MD, FARS

Rutgers New Jersey Medical School

**Objective:**

Our study investigates the association between patient age and the management and outcomes of inpatient acute rhinosinusitis (ARS).

**Methods:**

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of ARS (ICD-10: J01). Patients aged 20 to 40, 41 to 64, and 65 to 90 years were identified as young, middle-aged, and elderly, respectively. Univariate and multivariable analyses were used to identify statistical associations by patient age.

**Results:**

Of the 4,355 ARS inpatients identified, 790 (18.1%), 1,635 (37.5%), and 1,930 (44.3%) were young, middle-aged, and elderly, respectively. The majority of patients were female (58.7%) and White (70.5%). On multivariable analyses, adjusting for patient and hospital demographics, middle-aged patients had \$7,472 fewer total charges, underwent 0.5 fewer procedures, had shorter time to first procedure (TFP) by 0.5 days, and had lower odds for orbital or intracranial complications (OR 0.38, 95% CI 0.25–0.57), and undergoing ear, nose, or sinus (ENS) excision (OR 0.48, 95% CI 0.37–0.62), ENS drainage (OR 0.60, 95% CI 0.45–0.80), and sinus inspection (OR 0.60, 95% CI 0.37–0.96) than young patients (p<0.05). Elderly patients had \$17,879 fewer total charges, shorter length of stay (LOS) by 1.2 days, underwent 1.3 fewer procedures, and had lower odds for orbital or intracranial complications (OR 0.49, 95% CI 0.31–0.77) and undergoing ENS excision (OR 0.23, 95% CI 0.16–0.32), drainage (OR 0.32, 95% CI 0.22–0.48), and resection (OR 0.20, 95% CI 0.10–0.38) than young patients (p<0.005).

**Conclusions:**

Middle-aged and elderly ARS inpatients had fewer total charges, LOS, TFP, number of procedures undergone, and complications than young patients.

## POSTERS

Poster #005

**Ameloblastoma transnasal endoscopic resection**

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Roy Casiano, MD, FARS

**Introduction:**

Ameloblastoma is a rare, benign tumor comprising around 1% of all sinonasal neoplasms, and there is a lack of robust literature detailing its presentation, diagnosis, surgical management, and prognosis. The current knowledge on surgical management of ameloblastoma comes from several small case series/retrospective reviews of combined open and endoscopic approaches, and a few case reports of purely endoscopic approaches. We wish to provide our experience with ameloblastoma cases managed with transnasal endoscopic resection to expand the currently scarce literature on the topic.

**Methods:**

This is a retrospective review of patients who underwent transnasal endoscopic resection for maxillary sinus ameloblastoma from Feb 1, 2012 to Feb 1, 2022 at the University of Miami Hospital.

**Results:**

Five patients were included in our study (mean age=58.40 ± 7.96). Four patients (80%) were male, and 1 patient (20%) was female. Two patients (40%) were White, 2 patients (40%) were Black, and 1 patient was Hispanic (20%). Presenting symptoms were most commonly epistaxis (n=2), unilateral nasal obstruction (n=2), congestion (n=2), and recurrent sinusitis (n=2). Mean follow-up was 26.33 months (range: 2.77-71.1). Intra-/post-operative complications were minimal: minor CSF leak (n=1) and formation of an oroantral fistula (n=2). Histologically, 3 cases demonstrated a conventional, follicular pattern and 2 cases a conventional, plexiform pattern. No patients in this study have experienced tumor recurrence to date.

**Conclusion:**

Transnasal endoscopic resection for ameloblastoma is an effective approach to the management of maxillary ameloblastoma.

Poster #006

**Anemia in skull base fractures**

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Rushi Patel, Medical Student  
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**Objective:**

Our study investigates the role of anemia in the management and outcomes of inpatients with skull base fractures (SBFs).

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary diagnosis of SBF (ICD-10: S02.1). Anemia was identified (ICD-10: D50–D64). Univariate and multivariable analyses were performed to identify statistical associations with anemia status.

**Results:**

Of the 2,510 inpatients diagnosed with SBF, the majority were male (72.2%), White (66.9%), and non-anemic (80.5%). Mean patient age was 46.8 years. Anemic patients had higher incidence of fluid and electrolyte disorders (47.9% vs. 19.8%), hypertension (37.3% vs. 29.1%), preoperative weight loss (10.9% vs. 2.5%), and coagulopathy (9.9% vs. 2.1%) than non-anemic patients ( $p < 0.001$ ). On multivariable analyses, adjusting for several demographics and comorbidities, anemic patients had greater total charges (\$215,377 vs. \$74,541), length of stay (LOS) (12.0 vs. 4.8 days), number of procedures undergone (5.3 vs. 1.7 procedures), time from admission to first procedure (TFP) (2.3 vs. 1.1 days), and odds for cerebral edema (OR 1.69, 95% CI 1.20–2.37), cerebrospinal fluid leak (OR 2.41, 95% CI 1.90–3.06), urinary tract infection (OR 3.09, 95% CI 2.30–4.16), sepsis (OR 4.90, 95% CI 2.93–8.17), respiratory complications (OR 5.93, 95% CI 4.20–8.36), respiratory failure (OR 5.09, 95% CI 4.42–5.86), and mortality (OR 1.88, 95% CI 1.52–2.34) than non-anemic patients ( $p < 0.005$ ).

**Conclusions:**

In a national SBF cohort, anemic inpatients had greater total charges, LOS, number of procedures undergone, TFP, and odds for complications than non-anemic inpatients.

## POSTERS

## Poster #007

**Anemia in transsphenoidal pituitary surgery**

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 Vraj P. Shah, Medical Student  
 Amar D. Desai, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS, FACS  
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## Objective:

Anemia has been associated with poorer outcomes across a variety of surgical procedures. Our study investigates the impact of anemia on management and outcomes of inpatients who underwent transsphenoidal pituitary surgery (TSPS).  
 Study Design: Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary procedure of TSPS (ICD-10: 0GB00ZX, 0GB00ZZ, and 0GT00ZZ). Anemia was identified (ICD-10: D50–D64). Univariate and multivariable analyses were performed to identify statistical associations with anemia status.

## Results:

Of the 3,615 inpatients identified, the majority were female (51.9%), White (56.5%), and non-anemic (80.5%). Mean patient age was 54.2 years. Anemic patients had higher incidence of chronic pulmonary disease (17.1% vs. 8.7%), hypothyroidism (40.8% vs. 25.8%), and fluid and electrolyte disorders (43.4% vs. 14.8%), than non-anemic patients ( $p < 0.001$ ), and similar incidence of obesity (25.0% vs. 21.5%) and hypertension (53.9% vs. 51.9%). On multivariable analyses, adjusting for patient demographics, hospital data, and severity of illness, anemic patients had greater total charges (\$177,817 vs. \$96,862,  $p < 0.001$ ), length of stay (LOS) (8.5 vs. 4.3 days,  $p < 0.001$ ), number of procedures undergone (4.1 vs. 3.1 procedures,  $p < 0.001$ ), and greater odds for urinary tract infection (OR 4.00, 95% CI 2.29–6.95,  $p < 0.001$ ), and post-procedure pituitary dysfunction (OR 1.98, 95% CI 1.04–3.78,  $p = 0.038$ ) than non-anemic patients ( $p < 0.001$ ).

## Conclusions:

In a national TSPS cohort, anemic patients had greater total charges, LOS, number of procedures undergone, and higher odds for infection and post-procedure pituitary dysfunction than non-anemic patients.

## Poster #008

**Anteriorly based middle turbinate flap: A cadaveric study and case series**

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## Introduction:

The turbinal flap based on the middle and superior turbinate mucosa and pedicled anteriorly on the ethmoidal artery system was recently described. This flap is anteriorly based and suitable for reconstruction of skull base defects along the ethmoid roof. Herein, we present a cadaveric anatomical study of an anteriorly based middle turbinate flap (ABMTF) that does not incorporate the superior turbinate mucosa and a case series of endoscopic spontaneous cerebrospinal fluid (CSF) leak repair.

## Methods:

Three fresh frozen cadaver heads were used to dissect the ABMTF. Flap dimensions and surface area were measured. A retrospective chart review identified five patients undergoing endoscopic CSF leak repair using the ABMTF from January 2017 until December 2021.

Demographic data, BMI, pre and postoperative SNOT 22 scores, size and location of the skull base defect and postoperative CSF leak rate were recorded. A step-by-step surgical technique is illustrated through video demonstration.

## Results:

Three ABMTF were dissected from cadavers and showed a mean flap surface area of 3.05 cm<sup>2</sup>. Five patients reconstructed with the ABMTF were identified. All patients were female, with an average BMI of 33.06, and presented with spontaneous CSF leak and/or meningoencephalocele along the ethmoid roof. One patient had meningitis prior to skull base reconstruction.

No intra and postoperative lumbar CSF drainage were used. One patient was treated post-operatively with acetazolamide for management of intracranial hypertension.

Postoperative SNOT 22 scores were significantly improved at the last follow up visit.

All patients were symptom free with no postoperative CSF leak and excellent flap tissue integration at follow up.

## POSTERS

## Poster #009

**Association between intraoperative findings and post-ESS endotype in patients with CRS**

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Regan Harmon

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## Background:

Identifying specific inflammatory pathways of chronic rhinosinusitis (CRS) is of interest in order to better target treatments. Here we explore the association between intraoperative findings and subsequent post-surgical endotype.

## Methods:

Intraoperative findings of purulent pus, hyperplasia, and allergic mucin were recorded on CRS patients undergoing endoscopic sinus surgery (ESS). Middle meatal mucus and measures of disease burden were obtained at follow-up, 6-12 months post-ESS. Type 1, 2, and 3 endotype was characterized as >90th percentile of non-CRS control patients' mucus levels of IFN- $\gamma$ ; ECP; or IL-17a; respectively. Multivariable logistic regression analyzed the association between surgical findings and post-ESS endotype, and Wilcoxon rank sum test compared measures of disease burden in those with and without specific endotypes.

## Results:

123 CRS patients underwent ESS, at which time 38 had purulent pus, 82 had hyperplasia, and 24 had allergic mucin. Pre-ESS, the mean Lund-Mackay Score (LM) was 12. After surgery, 5, 20 and 36 patients had a type 1, 2 and 3 endotype, respectively, while 69 patients had no endotype. Compared to those with no endotype, T1, T2 and T3 endotype were associated with higher post-ESS Modified Lund-Kennedy scores; T2 and T3 endotype were associated with higher post-ESS LM Scores; and the T3 endotype was associated with worse post-ESS CRS-PRO scores (17 vs 8,  $p=0.006$ ). Intraoperative purulent pus was associated with T1 and T3 endotype post-ESS (OR=12.9,  $p=0.046$ ; OR=2.99,  $p=0.018$ ).

## Conclusions:

The presence of purulent pus in patients undergoing ESS is associated with T1 and T3 endotypes after surgery, and may warrant postoperative measures that target those endotype specific pathways.

## Poster #010

**Association between research productivity and NIH funding in academic rhinology**

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Kush Panara, Resident Physician

Jennifer E. Douglas, Resident Physician

Rijul S. Kshirsagar, Dr.

Jacob G. Eide, MD

James N. Palmer, MD, FARS

Nithin Adappa, MD

## Background:

Academic research is important in advancing patient care and personal professional development. We sought to identify the role that National Institute of Health (NIH) funding and resident complement size have in influencing research productivity.

## Methods:

A cross-sectional study was performed using the American Medical Association FREIDA database to identify allopathic and osteopathic otolaryngology residency programs in the United States. Rhinology faculty with the title of assistant professor, associate professor, professor, or chair were identified from department websites. Rhinologists' academic data were obtained from both institutional web profiles and Scopus. The Pearson's correlation coefficient test was used to obtain  $r$  values associating academic productivity and NIH funding or residency size.

## Results:

Two hundred and sixty-five surgeons were identified. NIH funding versus number of publications yielded an  $r$  value of 0.182 ( $p=0.001$ ), NIH funding versus number of citations yielded an  $r$  value of 0.215 ( $p<0.001$ ), and NIH funding versus h-index had an  $r$  value of 0.238 ( $p<0.001$ ). Residency size versus number of publications was  $r=0.217$  ( $p<0.001$ ) and residency size versus number of citations was  $r=0.196$  ( $p<0.001$ ). Correlation between residency size and h-index was the strongest at  $r=0.261$  ( $p<0.001$ ).

## Conclusions:

Increased NIH funding and Otolaryngology resident complement size are correlated with increased academic rhinology research productivity. Further work into other factors associated with success will allow the rhinology community to continue to support faculty interested in research.



## POSTERS

Poster #011

**Association between SARS-CoV-2 and other respiratory viruses in sudden smell loss**

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Ronaldo Martins

Eurico Arruda

Fabiana Valera, MD, PhD

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**Background:**

Although the COVID-19 pandemic has dramatically increased the prevalence of cases with olfactory loss, other respiratory viruses can also cause this condition. We aimed to compare the sudden smell loss characteristics in patients with acute SARS-CoV-2 infection and other respiratory viruses, and to assess the SARS-CoV-2 viral load and co-infection impact on olfactory symptoms.

**Methods:**

Patients with sudden smell loss (< 10 days) were recruited in a multicenter prospective cohort study in 15 hospitals in Brazil. Clinical questionnaire, Connecticut Chemosensory Clinical Research Center (CCCRC) olfactory test and nasopharyngeal swab to perform a PCR-based respiratory viral panel were collected at first visit (day 0) and after 30 and 60 days.

**Results:**

188 of 213 patients presented positive test result for SARS-CoV-2, among which 65 were co-infected with other respiratory viruses (e.g. rhinovirus, enterovirus and parainfluenza). 25 had negative test results for SARS-CoV-2. Patients with SARS-CoV-2 infection presented a more severe mean smell loss score at inclusion than the negative group in both visual analogue scale (mean difference, -1.04; 95% IC, -1.79 to -0.29;  $p < 0.01$ ) and CCCRC (-0.55; -1.18 to 0.07;  $p = 0.08$ ). Both groups had significant smell scores improvement after 30 and 60 days, with no difference between them. Co-infection with other respiratory viruses and SARS-CoV-2 viral load did not impact olfactory scores.

**Conclusion:**

Although the intensity of olfactory symptoms is more severe at the onset in patients with Sars-Cov 2 infection, most patients from both groups recovered after 60 days. SARS-CoV-2 viral load and co-infections with other respiratory viruses were not associated with poorer olfactory outcomes.

Poster #012

**Association of allergic rhinitis and asthma with chronic rhinosinusitis and adenoiditis in children**

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Chadi Makary, MD, FARS

Hassan Ramadan, MD, FARS

**Introduction:**

The relationship of allergic rhinitis (AR), asthma and pediatric chronic rhinosinusitis (CRS) is still controversial. Our goal is to study that association in CRS and chronic adenoiditis (CA).

**Methods:**

Retrospective cohort study of pediatric patients who underwent surgical intervention for CRS was conducted. Demographic data, concurrent diagnosis of AR, asthma, smoke exposure, and CT Lund-Mackay scoring were recorded and analyzed. The main outcome of this study was identifying the association between AR, asthma and other risk factors in CRS and CA patients. CRS is defined as CT score of >5.

**Results:**

552 patients were included in this study. Mean age was 6.6 years (+/-2.9, 2-15), and 40.5% were female. 48.8% of patients had AR and 40.6% had asthma. 108 patients (19.6%) had CA and 444 patients (80.4%) had CRS. There was no age difference between CA and CRS (6.7 vs 6.6 years,  $p = 0.798$ ). AR and asthma prevalence were similar in CA and CRS (49 vs 47.9%,  $p = 0.853$  and 41.2 vs 38.5%,  $p = 0.616$ ). Multivariate analysis showed strong association between AR and asthma in both CA and CRS (OR=5.1,  $p = 0.01$ ; OR=3.4,  $p < 0.0001$  respectively). In CRS patients, AR was associated with age older than 6 years (OR=2.4,  $p = 0.01$ ), and asthma was associated with male gender (OR=1.7,  $p = 0.02$ ). In CA patients, AR and asthma were not associated with any risk factors.

**Conclusion:**

AR and asthma seems to be strongly associated in children with CRS and CA. In patients with CRS, AR is associated with older age, and asthma is associated with male patients.

## POSTERS

Poster #013

**Asthma in endoscopic sinus surgery**

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 Keshav D. Kumar, Medical Student  
 Vraj P. Shah, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Rutgers New Jersey Medical School

## Objective:

Asthma has been suggested to negatively impact outcomes of several otolaryngological procedures. Our study explores the burden of asthma in endoscopic sinus surgery (ESS) management and outcomes.

## Study Design:

Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was filtered for adult inpatients with a primary procedure of ESS (ICD-10: 09JY4ZZ). Asthma was identified (ICD-10: J45). Univariate and multivariable analyses were used to identify statistical associations with asthma status.

## Results:

Of the 390 patients who met inclusion criteria, the majority were male (52.6%), White (65.3%), and did not have asthma (76.9%). Mean patient age was 55.2 years. Patients with asthma had higher incidence of chronic pulmonary disease (72.2% vs. 6.7%,  $p<0.001$ ), deficiency anemias (22.2% vs. 13.3%,  $p=0.040$ ), diabetes mellitus (50.0% vs. 31.7%,  $p=0.001$ ), rheumatoid arthritis (11.1% vs. 5.0%,  $p=0.038$ ), and preoperative weight loss (16.7% vs. 6.7%,  $p=0.004$ ) but similar incidence of hypertension (38.9% vs. 50.0%,  $p=0.064$ ) as patients without asthma. On multivariable analyses, adjusting for patient and hospital demographics and several comorbidities, patients with asthma had greater total charges (\$114,758 vs. \$48,817,  $p<0.001$ ), length of stay (LOS) (8.5 vs. 4.2 days,  $p<0.001$ ), and time from admission to first procedure (1.6 vs. 1.0 days,  $p=0.032$ ) but similar number of procedures undergone (1.7 vs. 1.9 procedures,  $p=0.716$ ) and odds for respiratory failure (OR 0.84, 95% CI 0.18–3.80,  $p=0.816$ ) as patients without asthma.

## Conclusions:

In a national cohort of ESS inpatients, patients with asthma had greater total charges, LOS, and time from admission to first procedure than patients without asthma.

Poster #014

**Attitudes of perioperative communication and patient safety in rhinology**

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 Alexander Duffy, Dr.  
 Elina Toskala, MD, FARS  
 Gurston Nyquist, MD, FARS  
 Marc Rosen, MD, FARS  
 Mindy Rabinowitz, MD, FARS

## Introduction:

Effective interpersonal communication and adequate preparation are fundamental to improving healthcare outcomes and preventing errors in patient care. Systematic checklists have been shown to help improve communication, efficiency, cost, and outcomes for surgical fields outside of Otolaryngology. To date, no formal studies have investigated attitudes toward perioperative communication and patient safety in Rhinology. This study aims to assess perioperative providers' opinions and the subsequent need for a system checklist.

## Methods:

A cross-sectional survey of operative staff (rhinologists, trainees, and nursing) was employed, investigating satisfaction with perioperative safety, equipment functionality, and patient outcomes. A scale of 1 to 5 was used to assess agreement with provided statements (1 being least satisfied and 5 most satisfied).

## Results:

The overall response rate was 88% ( $n=30$ ). The mean score for the level of agreement with the statement "preoperative discussion translates into proper case execution" was 3.9/5; trainees had the highest score (4.1/5), followed by physicians (4/5), while the nursing staff reported the lowest score (3.8/5). Most participants felt that patient care was excellent (4.5/5). 78.5% of nursing staff agreed there is room for improvement in communication between staff, in contrast to 33.3% of physicians and 71.4% of trainees. 87% agreed that a formal checklist could prevent future errors.

## Conclusion:

While most providers agree that high-quality patient care is achieved, opinions regarding current communication and the need for improvement differ by role. Implementation of a perioperative checklist may improve satisfaction and communication and decrease the incidence of adverse events.

## POSTERS

Poster #015

**Biologic use in nasal polyps**

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 Julie Park, Senior Research Analyst  
 Elizabeth Packnett, Lead Researcher  
 Michael Bogart, Dr.

**Background:**

As novel biologics are introduced and guidelines for biologics evolve, there is a need for evidence on the real-world use of biologics in patients with nasal polyps (NP) to help inform treatment approaches. This retrospective analysis examined the use of biologics in patients with NP in the US.

**Methods:**

Adult patients with medical claims for NP were identified during a period prior to the approval of the first biologic for NP (from 6/30/2018 to 6/30/2019) using the MarketScan Commercial and Medicare Supplemental Databases. This period was defined as the identification period (IP); the following year was defined as the observation period (OP) (from 7/1/2019 to 6/30/2020) during which the biologic use was assessed.

**Results:**

Of the 5,997 patients identified with NP (58% male, mean age 48.1 years) who met eligibility criteria, 11% (n=642) used biologics and 9% (n=55) of biologic users had  $\geq 1$  NP surgery during the OP. The number of biologic claims during the OP was similar for those who had NP surgery and those who did not have surgery (8 vs. 8.6). Biologic users with NP surgery had fewer days on biologics than those without NP surgery (152.6 vs. 182.5 days). Biologic users had higher rates of several comorbid conditions than non-users, which included asthma (89.1% vs. 35.0%,  $p < 0.001$ ), allergic rhinitis (78.2% vs. 60.0%,  $p < 0.001$ ), GERD (23.2% vs. 15.7%,  $p < 0.001$ ), and COPD (12.3% vs. 6.9%,  $p < 0.001$ ).

**Conclusions:**

While a small percentage of NP patients received biologics, most had  $\geq 1$  medical comorbidity and few had recent surgery, with numerically less time on biologics with recent surgery. Comorbidity and surgical history offer key clinical factors which shape the evolving paradigm of biologic use.

Poster #016

**Biphenotypic sinonasal sarcoma: Case report with literature review**

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 Sami Belakhlef, MD  
 Camilo Reyes, MD, FARS  
 Medical College of Georgia Augusta University

**Background:**

Biphenotypic sinonasal sarcoma (BSNS) is a rare and low-risk tumor entity that exclusively arises in the sinonasal tract. It is accompanied by significant local recurrence rates and often presents with non-specific symptoms caused by mass effects and local invasion. In this report, we present a case of BSNS that resolved through surgical resection.

**Methods:**

Case report with literature review.

**Result:**

A 40-year-old female with myasthenia gravis and hypothyroidism with thyroidectomy presented with a 1.5-year history of worsening left nasal congestion, clear anterior rhinorrhea, and postnasal drainage. Following nasal endoscopy, a sinus CT confirmed a heterogenous soft tissue mass with abnormal density in the left maxillary and ethmoid sinuses extending into the left choana with associated opacification of left frontal and sphenoid sinuses. Subsequent biopsy of the mass confirmed a BSNS with PAX-MAML3 fusion and immunohistochemical positivity for S-100 and SMA, negative for SOX-10. An MRI was obtained for enhanced visualization which showed bone dehiscence in the left maxillary sinus. The mass was excised with negative surgical margins, and follow-up nasal endoscopy and CT showed no evidence of recurrence.

**Conclusion:**

BSNS continues to be challenging for clinicians due to a lack of consensus for optimal treatment. Generally, surgical resection with negative margins is accepted. In the presence of positive margins, adjuvant radiation therapy has been suggested due to its relatively high recurrence rate. The diagnosis of this malignancy continues to be an elusive endeavor that necessitates immunohistochemical analysis that is fundamental for treatment and prognosis.

## POSTERS

## Poster #017

**Carcinosarcoma of the nasal cavity and paranasal sinuses: A review of the national cancer database**

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**Background:**

Carcinosarcomas are rare and aggressive malignancies that can arise in the nasal cavity and paranasal sinuses. There are limited outcome data available to guide management. We sought to use the National Cancer Database (NCDB) to characterize treatment outcomes in sinonasal carcinosarcoma.

**Methods:**

A retrospective analysis of the NCDB from 2004-2016 for patients with sinonasal carcinosarcoma was conducted. Demographic, treatment, and survival information were obtained. Unadjusted Kaplan-Meier estimates, log-rank tests, and a multivariate Cox proportional hazard model were used to assess overall survival (OS).

**Results:**

Thirty patients were included in the analysis. They were predominantly male (n=20), white (n=23), and privately insured (n=15), with an average age of 62.4±14.7 years. The nasal cavity was the most common subsite (n=14), followed by the maxillary (n=8) and ethmoid sinuses (n=5). Most patient were treated with surgery followed by radiation (n=23, 76.7%), with the remaining undergoing surgery alone (n=4), radiation alone (n=2), or no treatment (n=1). A significant minority (n=10) received adjuvant chemotherapy. The 1- and 5-year OS in the cohort were 79.2% (95% CI: 65.6% - 95.5%) and 43.3% (95% CI: 27.7% - 67.9%), respectively. Log-rank testing showed OS varied based on intervention (p<0.029), sex (p<0.042) and age (p<0.025). On multivariate analysis, surgical treatment was associated with greater 5-year OS (HR=0.27, 95% CI: 0.07 - 0.95, p<0.042).

**Conclusion:**

Primary sinonasal carcinosarcoma is a rare malignancy with poor long-term outcomes. Surgical intervention improves survival, and future research is needed to assess the optimal timing of treatment and the roles for radiation and chemotherapy.

## Poster #018

**Chronic rhinosinusitis symptoms in CRS patients before and during the COVID-19 pandemic**

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**Introduction:**

The purpose of this study was to assess the effect of the COVID-19 pandemic on chronic rhinosinusitis (CRS) symptoms, eustachian tube quality of life, and vocal quality of life in CRS patients before and during the COVID-19 pandemic. This was accomplished through the use of validated Quality of Life instruments.

**Methods:**

Three surveys were used including the SNOT-22, VRQoL, and ETDQ-7 – all validated severity and quality of life instruments – and were distributed to 200 consecutive CRS patients from September 2018 to March 2022.

**Results:**

There were no significant differences in SNOT-22 scores (p=0.95), ETDQ-7 scores (p=0.97), or VRQoL scores (p=0.34) when comparing survey scores among patients prior to the pandemic and during the pandemic.

**Conclusion:**

This study shows that the effect of the COVID-19 pandemic on patients with chronic rhinosinusitis had no noteworthy variations on life quality and intensity of chronic rhinosinusitis symptoms, vocal or Eustachian quality of life when evaluated by the SNOT-22, VRQoL, or ETDQ-7 validated quality of life instruments.

## POSTERS

Poster #019

**Clinical predictors of successful symptom improvement following eustachian tube balloon dilation**

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**Objective:**

This study aims to identify predictors of treatment response to Eustachian Tube Balloon Dilation (ETBD) as measured by changes in Eustachian Tube Dysfunction Questionnaire-7 (ETDQ-7) scores.

**Methods:**

Patients who underwent ETBD at a single institution from 2017-2021 completed ETDQ-7 pre- and post-operatively. We conducted multivariable logistic regression analyses with ETDQ-7 normalization (<2.1 post-op) and minimum clinically important difference (MCID) (>0.5 pre-op – post-op) as outcome variables. Age, sex, ethnicity, prior ear or sinus surgery, pre-operative ETDQ-7 score, tympanogram type, chronic otitis media, rhinorrhea, inferior turbinate hypertrophy, deviated septum, allergic rhinitis, and follow-up time were included as covariates.

**Results:**

Among 113 patients, the mean age was 49 years old, 51% was females, and pre-operative ETDQ-7 was above 2.1 for all. After a mean follow-up period of 13 months, 78% achieved MCID and 37% normalized (pre: 4.7±1.2, post: 2.9±1.5). Every one-point increase in pre-operative ETDQ-7 score was associated with a 1.6-fold increase in odds of reaching MCID (aOR 95% C.I.= [1.04, 2.55]). Notably, 100% of patients with pre-operative ETDQ-7 of higher than 6 reached MCID. Moreover, a history of chronic otitis media predicted increased odds of ETDQ-7 normalization (aOR=2.84; 95% C.I.= [1.09-7.44]).

**Conclusion:**

Our findings suggest that ETBD was highly effective among patients with pre-operative ETDQ-7 above 2.1. Furthermore, a higher pre-operative ETDQ-7 score and a history of chronic otitis media were predictive of increased likelihood of symptom improvement and resolution. These factors may be important when counseling patients who are potential candidates for this procedure.

Poster #020

**Comparing the severity of chronic rhinosinusitis symptoms before vs. during the COVID-19 pandemic**

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Treatment for chronic rhinosinusitis is largely aimed toward alleviating symptoms and avoiding triggers. Due to the COVID-19 pandemic, measures such as masking, social distancing, and staying indoors have become familiar features of everyday life. While originally intended as a response to the coronavirus, such measures may also plausibly mitigate other respiratory illnesses, including chronic rhinosinusitis. Thus, this study aims to compare the severity of CRS symptoms in relation to the COVID-19 pandemic to evaluate whether measures such as masking and staying home have correlated with improved symptoms and/or quality of life in patients with CRS. We found that at the time of enrollment, overall SNOT-22 scores were significantly higher during the pandemic than before the pandemic (53 vs. 42,  $p = 0.002$ ). This effect persisted when evaluating the sleep (12 vs. 9,  $p < 0.001$ ), function (8 vs. 6,  $p = 0.004$ ), and emotion (4 vs. 3,  $p = 0.006$ ) domains individually. In addition, overall SNOT-22 scores were significantly lower during the pandemic than before the pandemic at 1 year follow up (18.17 vs. 12.22,  $p = 0.001$ ). This effect persists when looking at each of the nasal (7.33 vs. 5.13,  $p = 0.003$ ), sleep (2.63 vs. 1.39,  $p = 0.008$ ), function (1.40 vs. 0.72,  $p = 0.015$ ), and emotion (0.77 vs. 0.17,  $p < 0.001$ .) domains individually. Our results demonstrate that patients with CRS are experiencing a greater reduction in symptom severity in their first year of treatment during the pandemic compared to before the pandemic, suggesting a clinically significant contribution from lifestyle modifications such as masking and staying indoors.



## POSTERS

Poster #021

**Complications of absorbable intranasal packing:  
An analysis of the MAUDE database**

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**Introduction:**

Absorbable intranasal packing is commonly used after nasal and sinus surgeries to promote hemostasis, prevent synechiae, and reduce inflammation. However, there is little known about the complications that occur with their use.

**Methods:**

Retrospective analysis of the Manufacturer and User Facility Device Experience (MAUDE) database for adverse events associated with use of absorbable intranasal packing from 2010 to 2021.

**Results:**

85 reported adverse events were identified. Retained products (n=30, 35.2%) and failure to expand (n=19, 22.4%) were the most common adverse events. The most common patient symptoms reported were inflammation (n=15, 17.6%) and headache (n=12, 14.1%). We identified 34 (40%) major adverse events, defined as requiring admission (n=11, 32.4%), operation (n=10, 29.4%), or debridement/removal (n=14, 41.2%) following the event. Adverse events were more associated with packing comprised of carboxymethylcellulose (CMC) (n=57, 67.1%) than chitosan (n=11, 12.9%) or polyurethane foam (n=15, 17.7%). There were six cases of septic shock, which occurred more in polyurethane foam (n=4, 67%) than CMC use (n=2, 33%). Five patients suffered respiratory illnesses, all of whom had chitosan intranasal packing (n=5, 100%).

**Conclusions:**

Adverse events from absorbable nasal packing are rare, with only 85 cases reported in an 11-year period. However, when they occur, complications vary from minor symptoms to respiratory illness and septic shock. CMC nasal packing was more commonly associated with complications than its chitosan and polyurethane counterparts. This study confirms that although absorbable intranasal packing is generally safe, rare and potentially severe complications exist.

Poster #022

**COVID-19 and pituitary surgical volume trends**

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**Background:**

We sought to quantify trends in operative volumes and complications of endoscopic pituitary surgery before and after COVID-19 pandemic onset.

**Methods:**

We performed a retrospective analysis of adults undergoing neuroendoscopy for resection of pituitary tumor (CPT code 62165) with diagnosis of benign/malignant neoplasm of pituitary gland (D35.2/C75.1) or benign/malignant neoplasm of craniopharyngeal duct (D35.3/C75.2) using the TriNetX database for 2 years before (pre-COVID group) and 2 years after (post-COVID group) February 17, 2020.

**Results:**

1210 patients in the pre-COVID group and 1136 patients in the post-COVID group were compared. Age, gender, and race were statistically similar between the groups ( $P > 0.05$ ). Surgical volume decreased by 6% after COVID. In 2020 Q2, operative volume decreased by 19%, and in 2021 Q4 (peak COVID-19 caseload in US), operative volumes decreased by 29% compared to two years prior. There was no significant difference in the number of patients pre- and post-COVID who underwent resection of malignant pituitary neoplasm ( $p = 0.434$ ). However, benign pituitary neoplasm resection rates were statistically significantly lower in the post-COVID cohort ( $p < 0.001$ ). Meningitis ( $p = 0.6220$ ), post-operative CSF leak ( $p = 0.4481$ ), post-procedural respiratory failure ( $p = 0.5367$ ), visual field defect ( $p = 0.4168$ ), and readmission ( $p = 0.4403$ ) were similar between the two groups.

**Conclusions:**

Overall endoscopic pituitary resection volume is beginning to recover from the pandemic, but increased COVID-19 outbreaks are associated with decreased surgical volume. No statistically significant change in resection of malignant neoplasms was found. Patient outcomes were not worsened by decreased operative volumes.

## POSTERS

Poster #023

**Craniopharyngioma outcomes in children versus adults**

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**Background:**

Craniopharyngioma is a rare, benign neoplasm with the potential for significant impact on quality of life given the tumor's proximity to the pituitary gland, optic chiasm, and carotid arteries. Incidence of craniopharyngioma is bimodal, with peaks at age 5-14 and 50-75 years. The study sought to compare outcomes of craniopharyngioma in the adult and pediatric populations.

**Methods:**

A retrospective cohort study was performed using the TriNetX database. Subjects with a diagnosis of craniopharyngioma (ICD-10 D44.4) were included. The cohort was divided into pediatric (age <17 years) and adult (>18) cohorts. Endpoints were analyzed at one year following diagnosis, and overall survival and presence of obesity were calculated at five years. Two-tailed, unpaired t-tests were performed.

**Results:**

524 children and 10,918 adults met inclusion criteria. Five-year overall survival rates were 95% in the pediatric cohort and 93% in the adult cohort. A greater proportion of the adult cohort carried a diagnosis of obesity at 5 years (8.5% vs 5.7%,  $p=0.045$ ). 30-day readmission rates were similar between the two groups ( $p=0.46$ ). At one year, children were more likely than adults to experience visual changes (19% versus 14%,  $p=0.017$ ), hypopituitarism (40% versus 29%,  $p<0.01$ ) and treatment with radiation (15% versus 5%,  $p<0.01$ ).

**Conclusion:**

Craniopharyngioma is a rare tumor. Results found survival outcomes to be similar between children and adults, but children were more likely to experience hypopituitarism and visual changes, and undergo radiation. Pediatric patients treated for craniopharyngioma thus require particularly close, long-term follow-up for ongoing management of treatment-related sequelae.

Poster #024

**Cystic Fibrosis in pediatric chronic rhinosinusitis**

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**Objective:**

Chronic rhinosinusitis (CRS) is observed in the majority of patients with cystic fibrosis (CF). Our study investigates the relationship between CF and the management and outcomes of pediatric inpatient CRS.

Study Design: Retrospective database study.

**Methods:**

The 2016 Kids' Inpatient Database (KID) was queried to identify pediatric inpatients with a primary diagnosis of CRS (ICD-10: J32). CF status was identified (ICD-10: E84). Univariate and multivariable analyses were performed to identify statistical associations with CF status.

**Results:**

Of the 744 inpatients identified, the majority were male (58.7%), White (58.2%), had moderate loss of function (69.5%), and did not have CF (88.2%). Mean patient age was 9.4 years. CF patients had higher incidence of asthma (33.3% vs. 20.5%,  $p=0.007$ ), nasal polyps (35.2% vs. 4.7%,  $p<0.001$ ) and deviated nasal septum (8.0% vs. 3.8%,  $p=0.028$ ) than non-CF patients. On multivariable analyses, adjusting for patient demographics, hospital demographics, and severity of illness, CF patients had greater total charges (\$85,451 vs. \$35,800), length of stay (LOS) (6.5 vs. 3.1 days), number of procedures undergone (5.6 vs. 1.8 procedures), and time from admission to first procedure (3.5 vs. 1.2 procedures) than non-CF patients ( $p<0.001$ ). CF patients had greater odds for undergoing ear, nose, or sinus (ENS) excision (OR 3.45, 95% CI 2.02–5.90), drainage (OR 4.53, 95% CI 2.63–7.82), and resection (OR 8.00, 95% CI 4.21–15.23) procedures than non-CF patients ( $p<0.001$ ).

**Conclusions:**

In a pediatric CRS cohort, inpatients with CF had greater total charges, LOS, number of procedures undergone, time until first procedure, and odds for ENS excision, drainage, and resection than inpatients without CF.

## POSTERS

## Poster #025

**Depression in benign pituitary neoplasm**

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## Objective:

Our study investigates the effect of depression on the management and outcomes of inpatient benign pituitary neoplasm (BPN).

Study Design: Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of BPN (ICD-10: D35.2). Depression was identified (ICD-10: F06.3, F32, F33, and F34.1). Univariate and multivariable analyses were used to identify statistical associations with depression status.

## Results:

Of the 10,500 inpatients diagnosed with BPN, the majority were female (51.4%), White (55.0%), underwent pituitary surgery (86.0%), and did not have depression (90.1%). Mean patient age was 54.5 years. Patients with depression had higher incidence of chronic pulmonary disease (14.6% vs. 9.2%), diabetes (29.7% vs. 23.0%), hypertension (60.8% vs. 52.7%), obesity (33.0% vs. 21.9%), and sleep apnea (20.8% vs. 11.4%) than patients without depression ( $p<0.001$ ). On multivariable analyses, adjusting for patient and hospital demographics and several comorbidities, patients with depression had fewer total charges (\$82,312 vs. \$91,799,  $p<0.001$ ) but similar length of stay (LOS) (4.4 vs. 4.2 days,  $p=0.482$ ) and number of procedures undergone (3.0 vs. 3.1 procedures,  $p=0.069$ ) as patients without depression. Patients with depression had greater odds for mortality (OR 6.26, 95% CI 2.01–19.48) but lower odds for cerebral edema (OR 0.35, 95% CI 0.17–0.72) and cerebrospinal fluid leak (OR 0.77, 95% CI 0.62–0.95) than patients without depression ( $p<0.005$ ).

## Conclusions:

In a BPN cohort, inpatients with depression had fewer total charges and odds for cerebral edema and cerebrospinal fluid leak but greater odds for mortality than inpatients without depression.

## Poster #026

**Deviated nasal septum in chronic rhinosinusitis**

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## Objective:

Our study investigates the role of deviated nasal septum (DNS) in the management of inpatients with chronic rhinosinusitis (CRS).

## Study Design:

Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of CRS (ICD-10: J32). DNS was identified (ICD-10: J34.2). Univariate and multivariable analyses were performed to identify statistical associations with DNS.

## Results:

Of the 2,510 inpatients diagnosed with CRS, the majority were female (56.4%), White (69.0%), did not have DNS (87.6%), and did not undergo septoplasty (93.6%). Mean patient age was 57.4 years. Patients with DNS had higher incidence of asthma (19.4% vs. 15.0%), sleep apnea (22.6% vs. 11.6%), nasal polyps (22.6% vs. 8.2%), nasal turbinate hypertrophy (40.3% vs. 1.6%), and obesity (21.0% vs. 11.8%) but lower incidence of hypertension (38.7% vs. 52.0%) than patient without DNS ( $p<0.05$ ). On multivariable analyses, adjusting for patient and hospital demographics and severity of illness, DNS patients had greater total charges (\$56,091 vs. \$48,084), number of procedures undergone (6.7 vs. 2.1 procedures), and odds for having orbital or intracranial complications (OR 8.18, 95% CI 4.43–15.09) and undergoing septoplasty (OR 166.32, 95% CI 86.72–319.00) than non-DNS patients ( $p<0.001$ ). DNS patients had shorter time from admission to first procedure (0.3 vs. 1.2 days,  $p<0.001$ ) than non-DNS patients. DNS and non-DNS patients had similar length of stay (LOS) (2.6 vs. 3.2 days,  $p=0.194$ ).

## Conclusions:

In a national CRS cohort, DNS inpatients had greater total charges, number of procedures undergone, and odds for having orbital or intracranial complications and undergoing septoplasty.

## POSTERS

Poster #027

**Deviated nose entire framework approach**

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**Background:**

Establishing stable and long-term results in the correction of the deviated nose has been a nightmare even for experienced surgeons. Most patients have problems both in form and function. Analyzing the underlying anatomy in each case is important to establish the plan of treatment that differs in every case.

**Methods:**

Six hundred seventy selected deviated nose patients underwent different surgical procedures for correction of the deviated nose. More than three fourth of patients had a combination of more than four procedures to correct various aspects of deviation from radix to the tip. All types of deviated noses were operated in one stage with the correction of the pyramid and septum. Proper cuts and resections of cartilage and insertion of resected materials as different types of grafts were the basis of most techniques for correction.

**Results:**

Correction of form and function included restoration of the straight dorsum, reducing asymmetries and providing a functionally patent nasal valve. There was an improvement in breathing and appearance of the nose with varying degrees in our cases. Improvement was more noticeable in patients with multiple procedures to correct the entire framework from the radix to the tip.

**Conclusions:**

The deviated nose is a complex deformity extending from the radix to the tip. Successful surgery is not possible without the correction of tip deformities and asymmetries as an important part of the procedure.

Poster #028

**Delayed onset CSF rhinorrhea: An alternative presentation of post-traumatic meningoencephalocele**

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**Background:**

Traumatic cerebrospinal fluid (CSF) leaks usually present shortly after the event, especially at the anterior cranial fossa. The clinical signs of anterior cranial fossa fractures are CSF rhinorrhea, periorbital subcutaneous hematoma, as well as paralysis in several cranial nerves. Here, we present a unique case of a patient with one-year delayed onset of CSF rhinorrhea with a massive meningoencephalocele after a traumatic head injury.

**Methods:**

Case Report with literature review.

**Results:**

A 57-year-old female presented with progressive right nasal congestion and occasional paresthesia of right infra and supraorbital regions for 1 year following a traumatic head injury. She endorsed recent onset rhinorrhea for the last month and was diagnosed by an outside provider with a CSF leak. A CT and MRI showed a large Sino-nasal mass with anterior skull base defect. Patient underwent endoscopic repair of cerebrospinal fluid leak with postoperative acetazolamide and therapeutic drain.

**Conclusion:**

CSF rhinorrhea usually manifests shortly after craniofacial trauma. We expose an unusual presentation of a delayed onset CSF rhinorrhea likely following a traumatic head injury due to the patient's progressive nasal obstruction since her facial trauma. She had an increased ICP which could explain her massive encephalocele of the anterior cranial fossa which could've potentially plugged her defect.

## POSTERS

Poster #029

**Diabetes mellitus in orbital cellulitis**

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**Objective:**

Diabetes mellitus (DM) has been associated with poorer patient outcomes in many diseases. Our study investigates the influence of DM in the management and outcomes of inpatient orbital cellulitis (OC).

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of OC (ICD-10: H05.01). DM was identified (ICD-10: E08-E13). Univariate and multivariable analyses were performed to identify statistical associations with DM status.

**Results:**

Of the 2,130 orbital cellulitis inpatients identified, the majority were female (50.9%), White (62.8%), and did not have DM (76.3%). Mean patient age was 53.1 years. Patients with DM had higher incidence of fluid and electrolyte disorders (21.8% vs. 13.8%), renal failure (14.9% vs. 4.0%), hypertension (73.3% vs. 34.8%) and obesity (30.7% vs. 9.5%) than patients without DM ( $p < 0.001$ ). On multivariable analyses, adjusting for patient demographics, hospital data, and severity of illness, patients with DM had fewer total charges by \$7,016 ( $p < 0.001$ ), shorter length of stay by 0.4 days ( $p = 0.036$ ), underwent 0.4 fewer procedures ( $p < 0.001$ ), had greater odds of acute kidney injury (AKI) (OR 2.71, 95% CI 1.88–3.91,  $p < 0.001$ ) but lesser odds for undergoing ear, nose, or sinus (ENS) drainage (OR 0.24, 95% CI 0.12–0.49,  $p < 0.001$ ) and central nervous system (CNS) drainage (OR 0.18, 95% CI 0.05–0.70,  $p = 0.013$ ) than patients without DM.

**Conclusions:**

In a national cohort of orbital cellulitis inpatients, patients with DM had fewer total charges, shorter length of stay, underwent fewer procedures, had greater odds for AKI, but lesser odds for undergoing ENS and CNS drainage procedures.

Poster #030

**Disease-specific quality of life outcomes following anterior skull base surgery**

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 Daniel Beswick, MD, FARS  
 Michael Karsy  
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**Background:**

The literature demonstrates a limited understanding of disease-specific, quality-of-life (QOL) outcomes in anterior skull base (ASB) surgery. Our objective was to characterize postoperative QOL outcomes for ASB lesions following skull base surgery.

**Methods:**

A comprehensive review of the literature was performed using the PubMed, Scopus, Embase, and Cochrane databases for studies reporting pre- and postoperative, disease-specific, QOL outcome measures in ASB surgery using questionnaires validated for this treatment. Studies including patients that were administered either the anterior skull base quality of life (ASBQOL) questionnaire or the skull base inventory (SBI) were included. Investigations focusing on skull base surgery for pituitary lesions, survey validation and non-English studies were excluded.

**Results:**

A total of 112 studies were screened; two studies, comprising a total of 79 patients and focusing exclusively on the ASBQOL questionnaire, met the strict inclusion criteria for this meta-analysis. Using a fixed effect model, the mean ASBQOL score was similar at baseline (3.53), and at 6-months (3.45) postoperatively ( $p = 0.46$ ; mean difference: 0.05; 95% CI: -1, 1.09). With a significant improvement by 12-months post-operative (3.6) compared to baseline ( $p = 0.03$ ; mean difference: -0.89; 95% CI: -1.8, 0.01).

**Conclusion:**

Few investigations using validated instruments for ASB surgery exist, suggesting the need for additional prospective studies. Patient's disease-specific QOL, as measured by the ASBQOL questionnaire, demonstrated no improvements at 6-months, with significant improvements reported at 12 months post-surgery. This indicates that long-term follow-up may be necessary in future ASB outcomes investigations



## POSTERS

Poster #031

**Disparities in access to healthcare**

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**Background:**

Data demonstrate the significant impact of social determinants of health (SDH) on access to care in various non-otolaryngologic subspecialties. The objective of this study was to analyze the relationship between SDH and access to care in the non-specialist, community care setting, among patients with sinonasal symptoms.

**Methods:**

A survey designed to ascertain information on SDH, access to healthcare, and sinonasal symptoms was prospectively completed by a cohort of patients in two community care clinics with a similar Area Deprivation Index (measure of neighborhood socioeconomic disadvantage). A univariate analysis was conducted in order to assess the relationship between SDH and access to care for sinonasal complaints.

**Results:**

Among 99 patients surveyed, 51 were primarily English-speaking and 48 were primarily Spanish-speaking. Both patient populations demonstrated similar prevalence of sinonasal symptoms ( $p=0.41$ ,  $w=0.09$ , 95% CI = 0.004, 0.29), but English-speaking patients were significantly more likely to have seen a physician for their symptoms compared to Spanish-speaking patients ( $p=0.03$ ,  $w=0.38$ , 95% CI = 0.10, 0.65). Race ( $p<0.01$ ,  $w=0.52$ , 95% CI = 0.30, 0.78) and insurance status ( $p<0.01$ ,  $w=0.55$ , 95% CI = 0.37, 0.80) also had clinically meaningful associations with likelihood to have seen a physician.

**Conclusion:**

The present pilot investigation notes significant disparities in access to care in a non-specialist, community care setting for sinonasal symptoms based on primary language spoken, race, and insurance status. Future investigations with should focus on elucidating potential causes for the disparities observed.

Poster #032

**Dupilumab impact on SNOT-22 items and association with objective outcomes in CRSwNP**

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**Background:**

CRSwNP is a predominantly type-2 mediated inflammatory disease with high symptom and quality of life burden. Dupilumab significantly improved 22-item Sino-Nasal Outcome Test (SNOT-22) total score vs placebo in SINUS-24 and -52 (NCT02912468/NCT02898454), dupilumab was also well tolerated.

**Objectives**

To identify SNOT-22 items most important to patients and assess dupilumab's effect on these items and association with objective CRSwNP measures.

**Methods:**

Post hoc analysis of pooled SINUS-24/52 data. Changes in Nasal Polyp Score (NPS) and Lund-Mackay (LMK) score at W24 were assessed in patients with/without improvement (change  $<0$ ) at W24 in SNOT-22 items ranked most important by patients.

**Results:**

Decreased smell/taste and nasal blockage were ranked the most important SNOT-22 items at baseline (87% and 82% of patients, respectively). Improvement at W24 (dupilumab vs placebo) was reported by 77% vs 30% (decreased smell/taste) and 80% vs 44% (nasal blockage); improvement in both items, 71% vs 20%; no improvement in either item, 15% vs 46%. Dupilumab significantly ( $P<0.0001$  vs placebo) improved NPS and LMK irrespective of improvement in the SNOT-22 items at W24. Numerically greater improvements in both objective measures were seen in patients with SNOT-22 item improvements at W24: NPS, LS mean difference vs placebo -1.77 (both SNOT-22 items improved) vs -1.00 (neither item improved); LMK: -5.84 vs -2.98.

**Conclusions:**

Greater proportions of dupilumab vs placebo patients improved in symptoms cited most important by patients (decreased smell/taste; nasal blockage). Improvement in these symptoms signals greater improvement in objective measures.

## POSTERS

Poster #033

**Dynamics of dupilumab response in CRSwNP**

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**Background:**

CRSwNP is an inflammatory disease with high symptom burden. Dupilumab efficacy and safety in CRSwNP was demonstrated in the SINUS-52 study (NCT02898454).

**Objectives:**

Characterize onset, maintenance, and durability of response to dupilumab vs placebo in SINUS-52.

**Methods:**

The analysis included patients receiving dupilumab 300 mg once every 2 weeks or placebo for 52 weeks. Responses were defined as clinically meaningful improvements in nasal polyp score (NPS;  $\geq 1$  point), nasal congestion/obstruction (NC;  $\geq 1$  point), loss of smell (LoS;  $\geq 1$  point) score, and 22-item Sino-Nasal Outcome Test total score (SNOT-22;  $\geq 8.9$  points). Onset of response was defined as  $\geq 1$  response by Week 16; of those, maintenance of response was assessed at Week 52. Durability of response was defined having a response at  $\geq 5/6$  (NPS),  $\geq 11/13$  (NC),  $\geq 11/13$  (LoS), or  $\geq 5/6$  (SNOT-22) timepoints through Week 52.

**Results:**

303 patients (dupilumab/placebo: 150/153) were included. Onset: Proportions of patients with response at  $\geq 1$  visit by Week 16 (dupilumab vs placebo) were 75% vs 39% (NPS), 60% vs 24% (NC), 61% vs 16% (LoS), 83% vs 66% (SNOT-22). Maintenance: Of dupilumab-treated patients who responded by Week 16 (dupilumab vs placebo),  $>82\%$  vs  $>20\%$  (NPS),  $>84\%$  vs 50% (NC),  $>87\%$  vs 50% (LoS), and  $>86\%$  vs  $>44\%$  (SNOT-22) maintained response at Week 52. Durability: Proportions of patients with durable response over 52 weeks (dupilumab vs placebo) were 47% vs 3% (NPS), 47% vs 9% (NC), 47% vs 4% (LoS), and 62% vs 22% (SNOT-22).

**Conclusion:**

A greater proportion of patients treated with dupilumab versus placebo demonstrated rapid onset of clinically meaningful response across objective and patient-reported endpoints; responses were durable and maintained over 52 weeks.

Poster #034

**Effects of delays in care in chronic rhinosinusitis patient's symptom severity and outcomes**

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**Introduction:**

The purpose of this study was to assess how delays in undergoing sinus surgery for the treatment of chronic rhinosinusitis relate to pre-operative symptom severity scores as well as outcomes following endoscopic sinus surgery.

**Methods:**

100 CRS patients were given the SNOT-22 validated questionnaire assessing the symptom severity of their CRS preoperatively and again 3 months postoperatively. Patients were divided into 2 groups for analysis – those who underwent surgery within 12 months of initial recommendation by their otolaryngologist and those who did not.

**Results:**

There were no significant differences in pre-operative SNOT-22 scores ( $p=0.33$ ) between those who delayed surgery more than 12 months versus those undergoing endoscopic sinus surgery within 12 months of initial recommendation by their surgeon. When looking at SNOT-22 scores 3 months postoperatively, there were no significant differences in improvement rates despite delays in care ( $p=0.21$ ).

**Conclusion:**

This study shows that there were no significant differences in average intensity of chronic rhinosinusitis symptoms, as evaluated by the SNOT-22 validated quality of life instrument, when delays in surgery greater than 12 months were present. There was also in significant difference in improvement rates despite delays in care.

## POSTERS

Poster #035

**Efficacy of olfactory training in treatment of post-viral vs post-traumatic olfactory dysfunction**

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Two common causes of olfactory dysfunction (OD) are post-viral olfactory dysfunction (PVOD) and post-traumatic olfactory dysfunction (PTOD). There is evidence for the use of olfactory training (OT) in the management of these patients. The purpose of this study is to evaluate the current literature on the effects of OT on PVOD versus PTOD. We hypothesize that patients with PVOD experience a greater improvement in olfaction after OT compared to patients with PTOD. A systematic review was conducted using PubMed, Embase, and Cochrane Library databases. Results were reviewed independently by two authors. Studies conducted between 2009 and 2022 assessing olfactory improvement in both PVOD and PTOD adult patients following OT were included. Studies that only included patients with OD due to neurodegenerative, autoimmune, syndromic, medications, or iatrogenic causes were excluded. Nine articles were selected for analysis. All articles found OT was associated with significant increase in olfaction in patients with OD. When isolating for etiology, two studies found a significant increase in olfactory function in patients with PVOD when compared to PTOD. Three other studies found that patients with PVOD, but not PTOD, experienced a significant increase in olfactory function. Six studies showed that a greater proportion of patients with PVOD experience a clinical improvement in olfaction when compared to PTOD. Four studies found no significant difference in olfactory improvement between PVOD and PTOD. Although there is evidence that OT is more effective for PVOD than PTOD, further studies with larger sample sizes are required to determine which populations will benefit most from OT.

Poster #036

**Endoscopic transnasal stenting of an obliterated eustachian tube: Case report of a novel technique**

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 Dennis Tang, MD  
 Cedar-Sinai Medical Center

**Background:**

An obliterated eustachian tube (ET) can lead to chronic otitis media (OM) and aural fullness even with treatment. One therapeutic option, reconstructing the ET, is not well-described in the literature. Previous reconstructive techniques utilized placing polyethylene tubes, nickel-titanium stents, or 16-gauge angiocaths in the nasopharyngeal ET orifice. We report a novel method of stenting using a trans-nasal lighted guidewire catheter and Propel™ Contour stents placed along the entire medial ET.

**Case Report:**

A 55-year-old male with a history of left-sided mucoid epidermoid carcinoma of the ET had previously undergone a radical nasal pharyngectomy with nasoseptal flap reconstruction (NSF) and adjuvant radiation. Post-operatively, he had mucoid OM with intolerable ear fullness. After tympanostomy tube placement, he had chronic otorrhea despite topical therapy, and the decision was made to reconstruct the ET. The NSF was elevated and the residual ET was identified. A lighted guidewire was passed through the ET lumen into the middle ear until transillumination was noted, confirming proper anatomic placement. The ET was dilated and two Propel Contour stents were placed in the medial ET. Postoperatively, his otorrhea decreased substantially.

**Conclusion:**

This is the first reported use of a lighted guidewire approach from the nasopharynx and Propel Contour stents in ET reconstruction. Our technique confers many unique advantages: 1) it allows for longer stenting of the full medial ET, 2) it provides anatomical confirmation of both the patency of the ET and accurate placement of the stents, and 3) it permits proper stenting even in the setting of distorted middle ear landmarks.

## POSTERS

Poster #037

**Evaluation of PGISS score as a measure of CRS disease activity**

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 Daniel Trotier  
 Matvey Karpov  
 Kent Lam, MD, FARS  
 Joseph Han, MD, FARS

**Background:**

Patient Global Impression of Symptom Severity (PGISS) scale is a visual analogue scale that measures patients' subjective symptom severity. SNOT-22 is a validated tool that measures patients' quality of life in chronic rhinosinusitis (CRS). To assess the clinical value of PGISS in relation to CRS, we investigated the correlations between PGISS and SNOT-22 scores and objective measures of CRS disease activity.

**Methods:**

A retrospective chart review of CRS patients was performed at a tertiary rhinology center. Data on PGISS and SNOT-22 scores, demographics, and treatment interventions were collected and analyzed.

**Results:**

A total of 150 subjects were evaluated. PGISS and SNOT-22 scores were found to be correlated ( $r=.697$ ,  $p<.0001$ ). Logistic regression models found that when compared to mild scores (0-3), patients with severe PGISS scores (8-10) had higher odds of changing their treatment plan (OR=4.82, 95% CI 2.29-10.14), receiving systematic steroids (OR=3.10, 95% CI 1.22-8.58), surgery (OR = 37.89, 95% CI 4.77-300.94), and imaging (OR=8.11, 95% CI 1.58-41.71). Alternatively, severe scores had decreased odds of receiving no medical intervention (OR=0.26, 95% CI 0.13-0.52). There were no significant statistical associations between PGISS scores and receiving topical steroidal ( $p=.104$ ), biological ( $p=.851$ ), or non-steroidal interventions ( $p=.154$ ).

**Conclusion:**

The PGISS score can predict patients' subjective symptom severity in CRS patients. It may also be used to predict certain treatment interventions, such as the need for systemic steroids, surgery, and imaging. The PGISS score may serve as a clinically valuable tool that aids clinicians' understanding of disease progression and therapeutic management of CRS patients.

Poster #038

**Exacerbated host-immune responses by the interaction between RV-C and the CDHR3 risk allele**

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Cadherin-related family member 3 (CDHR3), primarily expressed on the apical surface of ciliated airway epithelium, is the only known receptor for rhinovirus C (RV-C). Its single nucleotide polymorphism (SNP) rs6967330 allele (G to A) is associated with an increased risk of chronic rhinosinusitis (CRS) and RV-C infections are linked to CRS severity. The goal of the present study is to (1) elucidate the molecular mechanism by which the interaction between RV-C and CDHR3 with the rs6967330 risk allele (AG/AA) exacerbates CRS and (2) test our hypothesis that the CDHR3 risk allele enhances RV-C binding/replication and exaggerated host inflammatory responses. We collected sinonasal epithelial cells from CRS patients with the CDHR3 wild-type (GG) and the risk (AG/AA) allele ( $n=8$  per group). Cells were fully differentiated at the air-liquid interface (ALI) to induce CDHR3 expression and infected with RV-C ( $10^7$  copies/infection). Our results showed that viral replication is significantly increased by 5.6-fold in the risk allele ( $7.75 \times 10^8$  viral RNA copies) compared to the wild-type ( $1.38 \times 10^8$  copies,  $p=0.038$ ). The inflammatory response was assessed by a host-immune array of 105 cytokines. After RV-C infection, 16 cytokines showed significant induction in the culture media of ALIs expressing the risk allele, while only 8 cytokines were stimulated in the wild-type in response to RV-C infection. Furthermore, 5 stimulated cytokines (IL-18 BPa, CXCL11, CXCL9, CCL2, and GM-CSF) exhibited >2 fold higher levels in ALIs with the risk allele than with the wild-type. Our findings suggest that the CDHR3 rs6967330 risk allele could contribute to RV-C mediated CRS exacerbation by increasing RV-C replication and exaggerating host inflammatory responses.

## POSTERS

Poster #039

**Exploring sociodemographic factors in allergic fungal rhinosinusitis**

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Priyanka Singh  
Julia Wei, Analyst  
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**Background:**

Allergic fungal rhinosinusitis (AFRS) is a subtype of chronic rhinosinusitis (CRS) that has historically been associated with younger age and Blacks. The role of demographic and socioeconomic factors in AFRS remains to be fully elucidated. Thus, we aim to evaluate these factors in AFRS disease prevalence and severity.

**Methods:**

Retrospective chart review was conducted of adult patients with AFRS and CRS from 2010-2019. AFRS was determined by Bent & Kuhn criteria, severity was assessed by radiographic evidence of cranioorbital invasion. Chi-square and t-test were used to assess demographic and socioeconomic differences between AFRS and CRS cohorts, and multivariate logistic regression was used to assess risk factors for severe AFRS. Geospatial analysis was performed to identify the presence of disease clusters and relation to significant variables.

**Results:**

Blacks represented 26.2% of the AFRS group and 4.9% of the CRS group, with pairwise comparison of race/ethnicity categories showing that Black race/ethnicity was significantly higher compared with other race/ethnicities in the AFRS group ( $p < 0.01$ ). AFRS and CRS groups differed significantly by age, with mean ages of 48.7 and 51.0 years, respectively ( $p = 0.04$ ). There were no significant differences in gender, Medicaid status, comorbidities, and socioeconomic status measures. Multivariate logistic regression showed that Blacks had lower odds of having severe AFRS (adjusted OR = 0.44; 95% CI: 0.23-0.85). Other variables were not significant predictors of severe AFRS. Geospatial analysis revealed some AFRS clusters in the Northern California Bay Area.

**Conclusion:**

AFRS has a unique predilection for Black patients, yet severe disease is less likely in this population.

Poster #040

**Gastro-esophageal reflux disease in transsphenoidal pituitary surgery**

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**Objective:**

Gastro-esophageal reflux disease (GERD) has been associated with poorer outcomes across a variety of rhinology surgical procedures. Our study investigates the influence of GERD in management and outcomes of inpatients who underwent transsphenoidal pituitary surgery (TSPS).

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary procedure of TSPS (ICD-10: 0GB00ZX, 0GB00ZZ, and 0GT00ZZ). GERD was identified (ICD-10: K21). Univariate and multivariable analyses were performed to identify statistical associations with GERD status.

**Results:**

Of the 3,615 inpatients who underwent TSPS, the majority were female (51.9%), White (56.5%), and did not have GERD (78.0%). Mean patient age was 54.2 years. Patients with GERD had higher incidence of congestive heart failure (5.0% vs. 1.8%), chronic pulmonary disease (17.6% vs. 7.3%), hypertension (69.8% vs. 47.2%), obesity (30.8% vs. 19.3%), and renal failure (9.4% vs. 3.4%) than patients without GERD ( $p < 0.001$ ). On multivariable analyses, adjusting for patient demographics, hospital data, and severity of illness, patients with GERD had fewer total charges (\$96,248 vs. \$107,695,  $p = 0.004$ ), length of stay (LOS) (4.2 vs. 4.9 days,  $p < 0.001$ ), number of procedures undergone (3.0 vs. 3.2 procedures,  $p = 0.005$ ), and lesser odds of post-operative respiratory complications (OR 0.29, 95% CI 0.14 to 0.63,  $p = 0.001$ ) than patients without GERD.

**Conclusions:**

In a national cohort of TSPS inpatients, patients with GERD had fewer total charges, LOS, number of procedures undergone, and lesser odds for post-operative respiratory complications than patients without GERD.



## POSTERS

## Poster #041

**Glomangiopericytoma: A case series**

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Seth Davis

Alex Labby, Fellow

Alexander Perez

Kyle Mannion

Robert Sinard

James Lewis, Jr.

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## Introduction:

Glomangiopericytoma is an uncommon diagnosis accounting for less than 0.5% of all sinonasal tumors. It is characterized as having low malignant potential, with complete surgical excision representing optimal treatment. Presenting symptoms are due to mass effect and vascularity of this tumor, including unilateral nasal obstruction or epistaxis. Accounts of this tumor in the literature remain sparse.

## Methods:

Single institution retrospective review.

## Results:

7 cases of glomangiopericytoma were identified through review of the electronic medical record from 2009 through 2021. Age at diagnosis ranged from 48 to 67 years, with a gender distribution of 5 males and 2 females. All subjects presented with a history of unilateral sinonasal obstruction of variable duration. Each underwent endoscopic resection of the mass with negative margins, and no adjuvant therapy was pursued. All pathologic specimens were significant for positive SMA staining, and negative cytokeratin AE1/AE3 staining. Active follow up ranged from 3 months to 10 years. Post-operative imaging was available and free of disease in 2 patients, while all cases were without endoscopic evidence of recurrence for the duration of recorded follow up.

## Conclusions:

This review of 7 cases of sinonasal glomangiopericytoma represents the largest known series of this rare pathology in the literature to date. Based on our experience, and in agreement with the available literature, this disease is reliably managed with complete surgical excision. When paired with close surveillance, adjuvant therapy can be avoided in uncomplicated cases. Although rare, glomangiopericytoma should be considered in the differential diagnosis of vascular sinonasal tumors.

## Poster #42

**Granulomatosis with polyangiitis and chronic rhinosinusitis**

Chengetai Mahomva, MD

Mohamad Chaaban

Bhavya Sharma

## Background:

Granulomatosis with polyangiitis (GPA) & eosinophilic GPA (EGPA) are treated medically with surgery rarely required. The purpose of this study was to describe and compare demographics, sinonasal manifestations, and CT findings in patients that underwent sinus surgery.

## Methods:

Retrospective chart review of GPA/EGPA patients that underwent sinus surgery between 2001-2022. GPA/EGPA patients were compared in regards to their manifestations, Lund-Mackay (LM) & global osteitis score (GOS).

## Results:

46 patients were included (32 with GPA). Mean age was 61 with 59% female, 87% white, and 4.3% black. For GPA, rates of epistaxis, nasal congestion, polyps, crusting & septal perforation were 25.8% and 64.5%, 32.3%, 71.0% & 45.2% respectively. Mean LM & GOS were 9.3 and 12.6 respectively. For EGPA, rates of epistaxis, nasal congestion, polyps, crusting & septal perforation were 7.7% and 100%, 84.6%, 0% & 7.7% respectively. For EGPA, mean LM and GOS scores were 14.7 & 7.9, respectively. There were statistically significant differences between GPA & EGPA in nasal congestion (64.5% vs 86.4%  $p = 0.013$ ), septal perforation (45.2% vs 7.7%  $p = 0.017$ ), crusting (71% vs 0%  $p < 0.001$ ), polyps (32.3% vs 84.6%  $p < 0.001$ ), and LM scores (9.3 vs 14.7  $p = 0.009$ ). Indications for surgery in GPA were related to infection/mucocele vs nasal polyps for EGPA. Repeat sinus surgery was ~ 15% over 3 years. Patients with crusting and history of prior sinus surgery had significantly higher GOS scores.

## Conclusions:

Infection/mucocele was the most common surgical reason in GPA. Crusting was exclusively present in GPA patients, and together with history of prior surgery were significantly associated with higher GOS scores.

## POSTERS

Poster #043

**Growth in endoscopic sinus cancer surgery over time**

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 Theodore V. Nguyen  
 Khodayar Goshtasbi  
 Arash Abiri, BS  
 Edward C. Kuan, MD, FARS  
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**Objective:**

Sinonasal tumors are overall rare, with a paucity in robust data evaluating trends in endoscopic resection as an alternative to open surgery. The purpose of this study is to analyze trends in surgical approach for the most common sinonasal malignancies over time.

**Methods:**

The 2010-2016 National Cancer Database was used to identify all non-palliative surgical cases of primary sinonasal esthesioneuroblastoma, squamous cell carcinoma, mucosal melanoma, rhabdomyosarcoma, angiosarcoma, chondrosarcoma, mucoepidermoid carcinoma, and SNUC/SNEC. The number of endoscopic surgeries, relative to open approaches, was tabulated per year. Univariate linear regressions were performed.

**Results:**

Inclusive of all cases, the proportion of surgeries that were approached endoscopically rose from 25.8% in 2010 to 35.7% in 2017 ( $R^2=0.93$ ;  $p<0.001$ ). By pathology, this rise was most dramatic in esthesioneuroblastoma, which rose from 38.3% of all cases to 60.0% of all cases in this period (3.4% increase per year;  $R^2=0.88$ ;  $p=0.002$ ). Comparatively, the percent of surgical mucosal melanoma cases that were approached endoscopically remained relatively stable (41.5% to 44.9%;  $R^2=0.28$ ;  $p=0.219$ ). By subsite, nasal cavity (17.0% to 29.4%;  $R^2=0.90$ ;  $p=0.001$ ) cases were increasingly done via an endoscopic approach. The number of centers offering an endoscopic approach to sinonasal malignancies increased from 117 in 2010 to 165 in 2016 ( $R^2=0.86$ ;  $p=0.003$ ), while the number of centers offering open treatment remained stagnant (244 to 238;  $R^2=0.006$ ;  $p=0.868$ ).

**Conclusion:**

Endoscopic surgery, though not uniformly possible for all tumors, for most all sinonasal malignancies has become more common over time across an increasing number of institutions.

Poser #044

**Hospital frailty risk score as a predictor of postoperative outcomes in sinonasal malignancies**

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 Sandeep Kandregula, Skull Base Fellow  
 Omar Ahmed, MD  
 Shirley Y. Su, Associate Professor  
 Michael Yim, MD  
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**Background:**

Frailty, defined as a decline in physiological reserve against stressors, has been associated with negative health outcomes. We aim to establish the predictive role of frailty in short-term post-operative outcomes of sinonasal malignancies.

**Methods:**

We queried the NIS data from 2016 to 2019 for adult patients with a diagnosis of sinonasal malignancy who underwent surgery. Frailty-defining diagnosis clusters from the Hospital Frailty Risk Score (HFRS) were utilized to categorize patients into low risk (0-5), intermediate-risk (5-15), and high-risk frailty groups (>15). The comorbidity burden was assessed using the Elixhauser Comorbidity Index (ECI). Outcomes analyzed included complications, extended length of stay (ELOS), and non-home discharge (NHD).

**Results:**

A total of 4455 patients were included in this study. Based on HFRS, 82.8% of patients were low-risk, 16.2% intermediate-risk, and 1% high-risk. The mean age in low-risk group was 60 years, 64.2 years in intermediate-risk group, and 70 years in high-risk group ( $p=0.04$ ). Higher risk groups were associated with higher comorbidity scores (10.1, 20.6, 26.3,  $p<0.001$ ), had a higher rate of complications (9.1%, 50.7%, 77.8%,  $p<0.001$ ), increased ELOS (15.2%, 54.9%, 66.7%,  $p<0.001$ ), and increased NHD (22.6%, 58.3%, 66.7%,  $p<0.001$ ). ROC curves revealed a higher discriminating capacity for frailty compared to age and comorbidity score for all outcomes. Logistic regression analysis controlling for gender, race, insurance, and socioeconomic status showed a positive association between HFRS and all outcomes.

**Conclusion:**

Frailty is an independent predictor of postoperative complications, length of stay, and non-home discharge for patients with sinonasal malignancies.

## POSTERS

## Poster #045

**Hospital profit status in acute rhinosinusitis**

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 Keshav D. Kumar, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
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## Objective:

Private for-profit (FP) hospitals have become increasingly more prevalent. Our study describes the influence of hospital profit status on the healthcare utilization of inpatients diagnosed with acute rhinosinusitis (ARS).

Study Design: Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis related to ARS (ICD-10: J01), and hospital ownership was identified with data obtained from the American Hospital Association (AHA) Annual Survey of Hospitals. Patients treated at FP and private non-profit (NP) hospitals were compared.

## Results:

Of the 3,850 inpatients diagnosed with ARS, 3,315 (75.5%) and 535 (12.2%) were treated at NP and FP hospitals, respectively. The majority of patients were female (58.6%) and White (71.4%). Mean patient age was 59.1 years. FP patients had higher incidence of allergic rhinitis (5.6% vs. 2.6%), but lower incidence of nasal polyp (0.9% vs. 3.5%) and deviated nasal septum (1.9% vs. 4.1%) than NP patients ( $p < 0.015$ ). On multivariable analyses, adjusting for patient and hospital demographics and illness severity, FP patients had greater total charges (\$45,171 vs. \$37,304), shorter length of stay (LOS) (2.7 vs. 3.8 days), fewer number of procedures undergone (0.6 vs. 1.1 procedures), and lower odds for having orbital or intracranial complications (OR 0.30, 95% CI 0.12–0.74), undergoing sinus inspection (OR 0.21, 95% CI 0.09–0.53), and undergoing ear, nose, or sinus (ENS) excision (OR 0.62, 95% CI 0.41–0.92) and drainage (OR 0.42, 95% CI 0.26–0.67) than NP patients ( $p < 0.05$ ).

## Conclusions:

## Poster #046

**Hospital region in pediatric acute rhinosinusitis**

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 Amar D. Desai, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Larner College of Medicine

## Objective:

Our study describes the role of hospital region in pediatric acute rhinosinusitis (ARS) management and outcomes.

## Study Design:

Retrospective database study.

## Methods:

The 2016 Kids' Inpatient Database (KID) was used to identify inpatients with a primary diagnosis of ARS (ICD-10: J01). Hospital region is defined by KID via national census division as Northeast (NE), Midwest (MW), South, and West. Univariate and multivariable analyses were used to describe statistical correlations between hospital regions.

## Results:

1,184 patients met inclusion criteria and were treated at hospitals located in the NE (20.1%), MW (21.9%), South (40.6%), and West (17.4%). On multivariable analyses, adjusting for patient and hospital demographics and severity of illness, MW patients had fewer total charges by \$7,461 ( $p = 0.014$ ), shorter length of stay (LOS) by 0.5 days ( $p = 0.043$ ), underwent 0.5 more procedures ( $p = 0.021$ ), and had greater odds for cellulitis (OR 1.58, 95% CI 1.01–2.48,  $p = 0.045$ ) than NE patients. Southern patients had similar total charges ( $p = 0.862$ ), number of procedures undergone ( $p = 0.692$ ), and LOS ( $p = 0.855$ ) as NE patients. Western patients had greater total charges by \$21,787 ( $p = 0.034$ ), similar LOS ( $p = 0.466$ ), underwent 0.6 more procedures ( $p = 0.026$ ), and had greater odds for cellulitis (OR 2.69, 95% CI 1.70–4.27,  $p < 0.001$ ), orbital or intracranial complications (OR 2.13, 95% CI 1.27–3.56,  $p = 0.004$ ), and for undergoing ear, nose, and sinus (ENS) drainage (OR 1.78, 95% CI 1.06–2.98,  $p = 0.029$ ) and central nervous system drainage (OR 2.37, 95% CI 1.10–5.09,  $p = 0.027$ ) than NE patients.

## Conclusions:

In a cohort of pediatric inpatients with ARS, total charges, LOS, procedures undergone, and complications varied by hospital region.

## POSTERS

## Poster #047

**Hypothyroidism in endoscopic sinus surgery**

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## Objective:

Hypothyroidism (HTD) has been associated with poorer outcomes in various otolaryngological procedures. This study investigates HTD status in the inpatient management of endoscopic sinus surgery (ESS).

## Study Design:

Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was queried for adult inpatients with a primary procedure of ESS (ICD-10: 09JY4ZZ). HTD was identified (ICD-10: E00-E03, E89.0). Univariate and multivariable analyses were used to identify statistical associations with HTD status.

## Results:

Of the 390 patients who met inclusion criteria, majority were male (52.6%), White (65.3%), and did not have HTD (85.9%). Mean patient age was 55.2 years. Patients with HTD had higher incidence of chronic pulmonary disease (36.4% vs. 19.4%), fluid and electrolyte disorders (36.4% vs. 16.4%), liver disease (18.2% vs. 6.0%), renal failure (27.3% vs. 6.0%), valvular disease (18.2% vs. 1.5%), and preoperative weight loss (18.2% vs. 7.5%) than patients without HTD ( $p < 0.015$ ). Patients with and without HTD had similar incidence of hypertension (54.3% vs. 46.3%,  $p = 0.255$ ), diabetes mellitus (36.4% vs. 35.8%,  $p = 0.938$ ), and obesity (9.1% vs. 17.9%,  $p = 0.104$ ). On multivariable analyses, adjusting for patient demographics, hospital data, and severity of illness, patients with HTD had greater total charges (\$90,546 vs \$59,681,  $p < 0.001$ ), length of stay (LOS) (6.4 vs. 5.0 days,  $p = 0.045$ ), and number of procedures undergone (2.6 vs. 1.8 procedures,  $p < 0.001$ ) and lower odds for respiratory failure (OR 0.20, 95% CI 0.05 – 0.82,  $p = 0.026$ ) than patients without HTD.

## Conclusions:

In a national cohort of ESS, inpatients with HTD had greater total charges, LOS, and number of procedures undergone than those without HTD.

## Poster #048

**Iatrogenic rhinolith in a new American: Case report and review of the literature**

Daniel Mitchell, BS

Quinn Self, Resident

Carolyn Orgain, MD

## Background:

A rhinolith is a nasal foreign body which serves as a nucleus for calcium salt deposition. When left untreated, stones may cause unilateral nasal obstruction, rhinorrhea, nasal discharge, epistaxis, or in rare cases septal/palatal perforation or oro-antral fistula. This report presents a case of iatrogenic rhinolith in a new American and reviews the literature on treatment and diagnostic work-up.

## Methods:

Using retroactive chart review, we analyzed clinical, radiologic, and pathologic features along with diagnostic work up and outcomes of a single new American diagnosed with iatrogenic rhinolith in January 2022. PubMed was utilized to identify cases of Rhinolith reported between 2000-2022. Presenting symptoms, clinical findings, and outcomes were compared.

## Results:

The patient presented with non-specific right nasal discharge and epistaxis. He had a history of right sided endoscopic nasal surgery 2.5 years in Afghanistan. An obstructing mass was discovered on examination and removed surgically without complication confirming suspected diagnosis of rhinolith.

## Conclusion:

Rhinolith should be included in the differential for any unilateral obstruction with epistaxis, rhinorrhea, or other associated symptoms, particularly in the setting of a history of nasal surgery.

## POSTERS

Poster #049

**Identification of dendritic cells in CRS-associated nasal polyps by immunohistochemistry**

Amelia Lawrence

Danielle Hunter, Research Technologist

Marisa Griesel, Research Technologist

Stephen Voss, Research Technologist

Belinda Galeano

Kathleen Bartemes, PhD, Research Associate

Rohit Divekar, MBBS, PhD, Consultant - Allergic Diseases

Erin O'Brien, MD, FARS

**Background:**

The pathophysiology of chronic rhinosinusitis with nasal polyps (CRSwNP) is not completely understood but is thought to involve both the innate and adaptive immune systems. Dendritic cells (DC), which are a crucial link between these two responses, are of special interest in the pathophysiology of nasal polyp (NP) formation. Prior studies of DCs in nasal polyps have utilized staining for cell surface markers that are found on DCs, but also found on monocytes, macrophages, and other cell types. Therefore, the localization of specific DCs in polyp tissue versus non-DC cells is not entirely known.

**Objective:**

Our aim was to characterize expression of DC and non-DC specific cell surface markers in NP tissue of CRSwNP patients using immunohistochemistry (IHC).

**Method:**

NP tissues were collected from 7 subjects with CRSwNP and stained with CD1c+ (myeloid DC, B cells and monocytes), CD141+ (myeloid DC cells and vascular endothelium) and CD14+ (monocyte-derived macrophages).

**Results:**

We were able to detect CD1c+, CD141+, and CD14+ cells in polyp tissue. NP morphology was heterogenous and the number of positive cells varied from polyp to polyp. However, more edematous polyps consistently had fewer positive cells. Our results demonstrated similarities in CD1c+ and CD14+ cells, which were concentrated near the epithelium and lamina propria of the NP and scattered throughout the stroma. In contrast, CD141+ cells were dispersed throughout the stroma and associated with vascular structures.

**Conclusion:**

Identification of DC markers confirmed the ability to detect CD1c+ and CD141+ cells in NP tissue, providing insight into the possibility of characterization of DC subsets and their role in NP formation using IHC.

Poster #050

**Impact of resident and fellow participation in endoscopic sinonasal procedures—A NSQIP study**

Priyanka Singh, BA

Wesley Chan, Medical Student

Nadeem Akbar

Jean Anderson Eloy, MD, FARS

Christina H. Fang, MD

**Objectives:**

To assess the impact of resident and fellow participation on 30-day postoperative complications and outcomes following endoscopic sinonasal procedures (ESNS).

**Methods:**

All cases of ESNS from 2005-2012 were queried using the National Surgical Quality Improvement Program (NSQIP) database. Demographics, comorbidities, and postoperative complications between attending-only and attending with resident/fellow (trainee) cohorts were compared using univariate and binary logistic regression analyses.

**Results:**

272 cases of ESNS with data available for resident and fellow involvement were included in the analysis. 122 cases were performed with resident/fellow participation, and 150 cases were performed by attending physicians alone. Univariate analysis revealed that patients in the trainee group had higher incidences of diabetes ( $P=0.015$ ), hypertension ( $P=0.005$ ), central nervous system tumors ( $P<0.001$ ), steroid use ( $P=0.001$ ), and weight loss ( $P=0.025$ ). The patients in the attending only group had a higher incidence of obesity ( $P=0.005$ ). Logistic regression controlling for age, race, inpatient status, and comorbidities demonstrated lack of significance in the incidences of postoperative complications, readmittance, and reoperation between the attending-only and trainee cohorts.

**Conclusion:**

Analysis of the NSQIP database found that resident and fellow involvement in ESNS does not significantly impact the incidence of surgical complications, medical complications, readmittance, or reoperation.



## POSTERS

## Poster #051

**Improving accuracy of maxillary balloon dilation using virtual reality navigation: Proof of concept**

Kevin Grafmiller, MD  
 Dennis Tang, MD  
 William Yao, MD, FARS  
 Arthur Wu, MD, FARS  
 Satyan Sreenath, MD  
 Raj Sindwani, MD, FARS

**Background:**

Despite its rising popularity, balloon sinus dilation (BSD) of the maxillary sinus has been shown to be quite inaccurate. The crux of the issue is that there is no reliable way for the surgeon to confirm if the balloon has truly entered the sinus via the natural ostium. Conventional CT guided navigation systems are helpful when dilating other sinuses, but they fail to provide meaningful feedback to guide accurate cannulation of the natural maxillary sinus ostium in real-time. This study explores the potential impact of a new navigation system with virtual reality (VR) functionality on successful BSD of the maxillary sinus.

**Methods:**

Using previously published methodology, a cadaveric evaluation of the accuracy of maxillary BSD with a VR equipped navigation system (Trudi, Acclarent, Irvine, CA) was undertaken. The natural maxillary sinus ostium was landmarked on CT images with a beacon, and a VR, intrasinus camera-view was used to guide balloon dilation by a team of 2 Rhinologists. Following the procedure, uncinectomies were performed to directly assess the accuracy of dilation. Standardized video clips with a 30-degree endoscopic view of the area were reviewed by 3 blinded, fellowship-trained Rhinologists from different institutions.

**Results:**

Sixteen maxillary BSDs were completed in 8 cadavers using VR navigation. The accuracy rate for dilation of the maxillary sinus natural ostium was 80.4%. Despite the use of cadaveric tissues, a fair interrater agreement ( $\kappa$  0.21) was achieved.

**Conclusion:**

Using VR navigation may improve the accuracy of cannulating the natural ostium during maxillary BSD, which could lead to better outcomes. Further study in live patients is warranted.

## Poster #052

**Income in benign pituitary neoplasm**

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 Vraj P. Shah, Medical Student  
 Amar D. Desai, Medical Student  
 Rushi Patel, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Rutgers New Jersey Medical School

**Objective:**

Patient household income (PHI) has been suggested to affect the management of several otolaryngological diseases. Our study investigates the role of PHI in inpatient benign pituitary neoplasm (BPN) management.

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of BPN (ICD-10: D35.2). High income (HI) and low income (LI) patients were defined as being above and below the national median household income, respectively. Univariate and multivariable analyses were used to identify statistical associations with PHI.

**Results:**

Of the 10,500 inpatients identified, the majority were female (51.4%), White (54.9%), underwent pituitary surgery (86.0%), and HI (50.4%). Mean patient age was 54.5 years. HI patients had lower incidence of diabetes mellitus (21.8% vs. 25.6%), hypertension (49.8% vs. 57.7%), and obesity (20.9% vs. 24.7%) than LI patients ( $p < 0.001$ ). On multivariable analyses, adjusting for several demographics and comorbidities, HI patients had shorter length of stay (LOS) by 0.5 days, shorter time from admission to first procedure (TFP) by 0.3 days, and underwent 0.3 fewer procedures ( $p < 0.05$ ) but had similar total charges ( $p = 0.605$ ) as LI patients. HI patients had greater odds for cerebral edema (OR 2.16, 95% CI 1.07–4.37) and respiratory complications (OR 3.16, 95% CI 1.25–8.01) but lower odds for urinary tract infection (OR 0.44, 95% CI 0.24–0.80), respiratory failure (OR 0.26, 95% CI 0.10–0.67), and mortality (OR 0.11, 95% CI 0.02–0.72) than LI patients ( $p < 0.035$ ).

**Conclusions:**

BPN inpatients with HI had shorter LOS and TFP, underwent fewer procedures, and had lower odds for mortality than BPN inpatients with LI.

## POSTERS

Poster #053

**Income in Black and Hispanic patients with skull base fractures**

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**Objective:**

Patient race and household income have separately been demonstrated to influence the management of several medical and surgical procedures. Our study investigates the role of household income in the management and outcomes of Black and Hispanic (B&H) inpatients with skull base fractures (SBFs).

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary diagnosis of SBF (ICD-10: S02.1). Low income (LI) and high income (HI) B&H patients were defined as being in the first and fourth quartile of national household income, respectively. Univariate and multivariable analyses were used to identify statistical associations by income.

**Results:**

Of the 1,075 B&H inpatients diagnosed with SBF, the majority were male (80.0%), Black (50.7%), and LI (80.0%). Mean patient age was 40.7 years. HI B&H patients had higher incidence of depression (11.6% vs. 2.3%) and psychoses (11.6% vs. 2.9%), but lower incidence of obesity (0.0% vs. 8.1%) than LI B&H patients ( $p < 0.05$ ). On multivariable analyses, adjusting for patient and hospital demographics and several comorbidities, HI B&H patients had shorter length of stay (LOS) (4.1 vs. 6.4 days), time from admission to first procedure (0.8 vs. 1.8 days), and underwent fewer procedures (1.5 vs. 2.6 procedures) ( $p < 0.05$ ) than LI B&H patients. However, HI B&H patients had similar total charges (\$83,719 vs. \$104,639,  $p = 0.353$ ) and odds for mortality (OR 1.11, 95% CI 0.48 – 2.36,  $p = 0.811$ ) as LI B&H patients.

**Conclusions:**

In a national cohort of inpatients with SBF, HI B&H patients had shorter LOS and time until first procedure and underwent fewer procedures than LI B&H patients.

Poster #054

**Intrinsic nasal fibro-fat in rhinoplasty**

Mohsen Naraghi, MD, FARS

Dr. Naraghi Rhinology &amp; Facial Plastic Surgery Clinic

**Background:**

Various grafting materials have been described for augmentation in rhinoplasty, including bone, solid cartilage, crushed cartilage, diced cartilage-fascia, diced cartilage-glue, diced cartilage-surgicel, fascia, dermal graft, and alloplasts. All of these materials have potential problems such as visibilities and irregularities, unwanted reactions and inflammations and considerable resorption. The increased operation time for harvesting and donor site morbidities were other reasons which persuaded us to use intrinsic nasal fat as a graft material for different steps of rhinoplasty, including radix augmentation.

**Methodos:**

Forty six patients underwent open and closed approaches for primary rhinoplasty. After elevating the skin flap in a supraperichondrial plane, the lower lateral cartilages and cartilaginous dorsum were exposed. The fibro-fatty tissue over the lateral crura and between the medial crura was harvested with sharp scissors. One to three pieces of fat were usually obtained. Using a 6-0 PDS suture, all fat compartments were attached in a bead fashion, preserving the needle for passing through the skin.

**Results:**

Correction of form and function included restoration of the straight dorsum, reducing asymmetries, and providing a functionally patent nasal valve. There was an improvement in breathing and appearance of the nose with varying degrees in our cases. Improvement was more noticeable in patients with multiple procedures to correct the entire framework from the radix to the tip.

**Conclusions:**

The nasal fibro-fat graft is a suitable and easy harvested graft material with no morbidity for correction of radix hypoplasia. It could fit the place with no visibility problem.

## POSTERS

Poster #055

**Invasive fungal sinusitis - do topical steroids present a risk?**

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 Melanie Hicks  
 Timothy Norwood, MD  
 Do-Yeon Cho, MD  
 Bradford Woodworth, MD, FARS  
 Jessica Grayson, MD  
 University of Alabama at Birmingham

**Background:**

Acute invasive fungal sinusitis (AIFS) is a life-threatening, rapidly progressing infection occurring almost exclusively in immunocompromised patients. While oral steroid use can be a risk factor, there is no data to suggest that intranasal steroids increase the risk of AIFS. The objective of this study is to evaluate potential causes of AIFS in immunocompetent patients.

**Methods:**

A retrospective review was performed of all patients diagnosed with AIFS by histopathology from 2005-2021. Data regarding demographics, presenting signs, blood chemistry, fungal pathogen, and disease progression were collected. Patients were deemed immunocompetent if they had no diagnosed autoimmune condition, malignancy, chronic or current systemic steroid use, diabetes mellitus, or transplant history. Subjects meeting these criteria were selected from this population and analyzed.

**Results:**

Four patients were identified as immunocompetent with normal blood chemistries and no oral steroid use within the 3 months prior to diagnosis (age: 59±5.8 yrs). Three subjects had received prior endoscopic sinus surgery. Postoperative diagnosis ranged from 1-12 months and all received steroid rinses after surgery. One individual was surgery naïve. None had oral steroids within 3 months of diagnosis. At the time of diagnosis, one patient had recently stopped using steroid rinses, two were currently using steroid rinses, and one was using steroid nasal spray. Biopsy results of all subjects showed aspergillus species.

**Conclusion:**

In rare cases, immunocompetent patients can develop AIFS with only topical use of corticosteroids with a risk that could be higher after sinus surgery.

Poster #056

**July effect in orbital cellulitis**

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 Amar D. Desai, Medical Student  
 Vraj P. Shah, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Larner College of Medicine

**Objective:**

The "July Effect" suggests that patient care declines in July when graduating medical students begin their postgraduate training. Our study investigates the July Effect in the management and outcomes of orbital cellulitis (OC) inpatients.

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary diagnosis of OC (ICD-10: H05.01). Univariate and multivariable analyses were performed to identify statistical associations with July admission.

**Results:**

Of the 2,130 OC inpatients identified, the majority were female (50.9%), White (62.8%), and not admitted in July (91.3%). Mean patient age was 53.1 years. July admits had similar incidence of hypertension (37.8% vs. 44.6%,  $p=0.077$ ), obesity (10.8% vs. 14.9%,  $p=0.128$ ), and diabetes mellitus (8.1% vs. 10.3%,  $p=0.343$ ) as non-July admits. On multivariable analyses, adjusting for patient demographics, hospital data, and severity of illness, July admits had fewer total charges (\$25,397 vs. \$33,478,  $p=0.002$ ), shorter length of stay (LOS) (3.6 vs. 4.2,  $p=0.010$ ) and time from admission to first procedure (TFP) (0.7 vs. 1.8 days,  $p<0.001$ ), and greater odds for osteomyelitis (OR 6.33, 95% CI 2.06—19.47,  $p=0.001$ ), glaucoma (OR 2.14, 95% CI 1.35—3.41,  $p=0.001$ ), urticaria and erythema (OR 11.56, 95% CI 3.19—41.91,  $p<0.001$ ), and for undergoing drainage of the ear, nose, sinus (ENS) (OR 2.57, 95% CI 1.42—4.66,  $p=0.002$ ) and orbit (OR 2.83, 95% CI 1.38—5.82,  $p=0.005$ ) than non-July admits.

**Conclusions:**

In a national cohort of OC inpatients, July admits had fewer total charges, shorter LOS and TFP, and greater odds for osteomyelitis, glaucoma, and undergoing ENS and orbit drainage than non-July admits.

## POSTERS

Poster #057

**Landmark and techniques for in-office sphenopalatine ganglion block**

Francesco Caruana  
 Nathan Yang, Fellow  
 Jonathan Overvest, MD, PhD  
 David Gudis, MD, FARS

**Introduction:**

Facial pain is a common complaint which may be caused by rhinologic and non-rhinologic pathologies including migraines, cluster headaches, and neuralgias. The otolaryngologist may thus play a central role in diagnosing and initiating treatment for various facial pain syndromes and headache disorders. Although sphenopalatine ganglion (SPG) block is a recognized treatment option for these conditions, the literature on transnasal SPG injection techniques is limited. The objective of this study is to refine anatomic nasal landmarks and optimize a protocolized technique for in-office transnasal injection for SPG block.

**Methods:**

Eight cadaveric head specimens were systematically dissected by two fellowship-trained rhinologists and one rhinology fellow. Relevant measurements of anatomic critical landmarks and surgical instruments for SPG block were recorded.

**Results:**

On average, the center of the sphenopalatine foramen was located 5.94 mm (1.65 mm standard deviation) superior to the inferior border of the middle turbinate's basal lamella attachment to the lateral nasal wall. Using a 20G spinal needle bent at 70 degrees, a transnasal injection technique for SPG block is described. An accompanying video demonstrating the technique is provided in the supplementary materials.

**Conclusion:**

Using a cadaveric model, the inferior border of the middle turbinate basal lamella attachment to the lateral nasal wall may be used as an intra-nasal landmark for the transnasal injection of the sphenopalatine ganglion. Further testing in the clinical setting is required to assess the efficacy of this injection technique.

Poster #058

**MAUDE database analysis for adverse events associated with eustachian tube dilation**

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 Isaac L. Schmale, MD  
 Alexander K. Mandych, MD  
 University of Rochester School of Medicine & Dentistry

**Background:**

Eustachian tube balloon dilation is a minimally invasive technique used to improve persistent Eustachian tube dysfunction (ETD). Currently, the United States Food and Drug Administration (FDA) has approved the use of balloon dilation devices produced by three manufacturers but little is known about associated adverse events and subsequent management.

**Methods:**

Reports submitted to the FDA using the Manufacturer and User Device Facility Experience (MAUDE) database searched from January 2000 to present day were analyzed for adverse events and management.

**Results:**

A total of 12 adverse events were found in the database and further analyzed. Subcutaneous emphysema (n=7) was the most common event. Other less frequent events included patulous Eustachian tube (n=2), vascular dissection (n=1), nasopharyngeal mucocele (n=1), and tinnitus (n=1). A majority of patients who experienced subcutaneous emphysema received antibiotics (n=5) and were admitted to the hospital (n=4). The patient with a right carotid dissection 7 days post-procedure presented with a stroke and fully recovered after stent placement. There is little information about pre-procedural measures. Out of the two patients who did not fully recover, one has reported hearing loss and tinnitus 6 months post-procedure and the other remained distressed about their patulous Eustachian tube diagnosis and ongoing symptoms. Three patients underwent corrective surgical interventions. No one company had more associated adverse events reported.

**Conclusion:**

Subcutaneous emphysema is the most common adverse event after Eustachian tube dilation. Further studies exploring potential balloon dilation adverse events to allow for better patient counseling are warranted.

## POSTERS

Poster #059

**Medical malpractice trends in endoscopic orbital surgeries**

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 Dennis Tang, MD  
 Thomas Higgins, MD, FARS  
 Jonathan Ting, MD, FARS  
 Elisa Illing, MD, FARS  
 Arthur Wu, MD, FARS

**Background:**

This study aims to evaluate the complications and medicolegal risks of two common endoscopic orbital surgeries: orbital decompression and dacryocystorhinostomy (DCR). These procedures are performed by individual ophthalmologists, otolaryngologists, and multidisciplinary teams of both specialists.

**Methods:**

The Westlaw database was reviewed from 1980 to 2020 for medical malpractice cases involving orbital decompression and DCR surgeries. Data were compiled on plaintiff and defendant demographics, procedure performed, type of legal allegation, nature of injury, verdict or settlement awards, and case details. The Ophthalmic Mutual Insurance Company (OMIC) was also queried for all malpractice cases pertaining to orbital decompression and DCR from 1995 to 2021.

**Results:**

The Westlaw database included 60 cases total, comprised of 34 orbital decompression and 26 DCR cases; of these, 8 orbital decompression and 6 DCR cases met inclusion criteria. Of the 7 orbital decompression cases that were tried, a verdict in favor of the plaintiff was decided in 4 cases (57%). Of the 5 DCR cases that were tried, a verdict in favor of the plaintiff was decided in 2 cases (40%). In a search of all claims at OMIC, 31 cases were found (15 orbital decompression, 16 DCR). 22 of 31 cases were either dismissed or resulted in no payment. The remainder were settled out of court, with only one case being tried and the verdict supporting the defendant.

**Conclusion:**

Despite several thousand orbital decompressions and DCR surgeries being performed annually in the US, very few lawsuits involving these complex surgeries have gone to trial. However, of the cases that did go to trial, a relatively high rate of verdicts for plaintiffs was observed.

Poster #060

**Medicating the olfactory cleft: Nasal spray vs. drops in kaiteki position**

Daniel Spielman, MD  
 Lucas Axiotakis  
 Nathan Yang, Fellow  
 Alexandria Irace, Medical Student  
 David Gudis, MD, FARS  
 Jonathan Overdevest, MD, PhD

**Introduction:**

Olfactory dysfunction (OD) is a heterogeneous disorder with numerous treatment options, and topical intranasal corticosteroids often play an essential role in treatment. However, the optimal delivery mechanism for olfactory cleft (OC) distribution of topical nasal medication has not been rigorously studied. The objective of this study is to compare OC distribution of a topical agent delivered by conventional nasal spray (NS) versus drops in the Kaiteki position (KP).

**Methods:**

A cadaver model was developed, and a fluorescein-stained solution was delivered with a conventional NS device and with a medication dropper with the model in KP. Three blinded reviewers independently evaluated endoscopic images of solution distribution in surgically naïve OCs. A 0-3 point scale ranging from absence of staining (0) to heavy staining (3) was used to rate the degree of solution delivery to the OC. Mean staining scores for the NS and KP groups were then compared using the Wilcoxon rank-sum test.

**Results:**

NS administration was associated with mean OC staining of 1.07 (N=15 subsites, SD=0.99), whereas drop administration in KP was associated with a significantly increased mean OC staining of 2.07 (N=15 subsites, SD=1.12, p=0.016).

**Conclusion:**

Drops administered via KP achieve significantly increased distribution to the OC compared to conventional NS in a cadaver model. When recommending topical intranasal corticosteroids for patients with OD, clinicians should consider nasal drops in KP rather than conventional NS to optimize OC distribution. Understanding relative delivery of topical therapies, including corticosteroids, to the OC will better facilitate targeted treatment of olfactory pathologies.



## POSTERS

Poster #061

**Medication compliance in allergic fungal sinusitis of the frontal sinus and its impact on recurrence**

Eun Jeong

Edie Threlkeld, MS-3

Stilianos Kountakis, MD, PhD, FARS

Camilo Reyes, MD, FARS

Medical College of Georgia Augusta University

**Objective:**

The purpose of this study is to analyze the effect that medication compliance and adherence to clinical follow-up have on the recurrence of Allergic Fungal Sinusitis (AFS) of the frontal sinus.

**Methods:**

A retrospective review of 117 patients with AFS involving the frontal sinus and history of frontal sinus surgery were included. The following categories were analyzed: Primary vs. revision surgery, medical compliance (topical steroids/saline irrigations), and clinical follow-up. Medication compliance was assessed by reviewing medical charts and medication refills.

**Results:**

Of 117 patients, almost all underwent a Draf I procedure (96.6%). A total of 62 (53%) patients were lost to follow-up leaving 55 patients who were able to be followed through their disease course. Of the 55 patients, 32 (58.2%) were non-compliant and 26/32 (81.3%) had recurrent disease requiring revision surgery. Recurrent disease affected mostly the fronto-ethmoidal sinuses simultaneously (79.3%). From 23 medically compliant patients, only 3 (13%) had recurrent disease (OR 0.034 95% CI 0.0077 to 0.1557,  $p < 0.0001$ ). Patients lost for follow-up likely also had a high disease recurrence rate as non-compliant patients.

**Conclusion:**

This study shows how medication compliance plays an important role in surgical failure and disease recurrence in patients with frontal sinus AFS. Lack of clinical follow-up and medication adherence may explain why AFS patients often have advanced disease upon presentation. Rather than viewing the risk of recurrence as an inherent property of the disease course for AFS, we seek to highlight the importance of medical compliance to delineate the discrepancies in previous findings.

Poster #062

**Mepolizumab versus Dupilumab for chronic rhinosinusitis with polyps**

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Eric Wang, MD, FARS

University of Pittsburgh Medical Center

**Introduction:**

Biologic monoclonal antibody therapy offer new management strategies for patients with chronic rhinosinusitis with polyps (CRSwNP). However, the choice of either Dupilumab, Mepolizumab, or Omalizumab is not driven by comparative studies. Additionally, the role of these biologic therapies in managing comorbid asthma in addition to nasal polyposis is not well studied.

**Methods:**

We performed a retrospective chart review of patients with CRSwNP treated with Mepolizumab and subsequently developed a matched cohort of patients on Dupilumab. The primary outcomes were the change in nasal polyp score and overall SNOT-22. Secondary outcomes include change in asthma control and need for endoscopic sinus surgery.

**Results:**

A cohort of X patients on Mepolizumab were matched to 2X patients on Dupilumab. The incidence of discontinuing Mepolizumab as 16.7% and 10% for Dupilumab. Nasal polyp scores and SNOT-22 scores had a generalized improvement from both biologics, although Dupilumab was showed greater improvement. Mepolizumab had a higher incidence of revision endoscopic sinus surgery while on the medication with resulting improvement in both primary outcomes with continued therapy post-operatively. Asthma control was achieved in 5/6 patients on Mepolizumab compared to 5/8 for Dupilumab.

**Conclusion:**

Both Mepolizumab and Dupilumab appear to improve patient's quality of life and endoscopic polyp scores, however Dupilumab performs better at avoiding revision FESS in patients with CRSwNP. Furthermore, to maintain asthma control, Mepolizumab may be combined with FESS with excellent outcomes.

## POSTERS

Poster #063

**Metabolomics in sinusitis**

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 Kathleen Bartemes, PhD  
 Danielle Hunter, Research Technologist  
 Marisa Griesel, Research Technologist  
 Stephen Voss, Research Technologist  
 Rohit Divekar, MBBS, PhD, Consultant - Allergic Diseases  
 Erin O'Brien, MD, FARS  
 Mayo Clinic

**Background:**

Differentiating eosinophilic from neutrophilic rhinosinusitis is important as management depends on the nature of inflammation. Characterization is based on the endoscopic appearance of the nasal mucosa and mucus. The objective of this study was to identify differences in the metabolome of nasal mucus from patients with sinusitis.

**Methods:**

Patients were assigned to control (n=5), neutrophilic (n=5), and eosinophilic (n=5) groups based on the appearance of normal mucosa, inflamed mucosa with purulent discharge, or polypoid mucosa with thick non-purulent discharge, respectively. Mucus was collected on swabs and metabolites were extracted using liquid chromatography – mass spectrometry. An untargeted metabolomics approach was used to detect metabolites, and a targeted approach was used to select metabolic pathways implicated in sinonasal disease.

**Results:**

The pathways selected included arachidonic acid metabolism, glycerophospholipid metabolism, sphingolipid metabolism, glycolysis, pentose phosphate pathway, and pyruvate metabolism. In the glycerophospholipid pathway, glycerol-1-phosphate and glycerophosphocholine were significantly reduced in the eosinophilic and neutrophilic groups compared to the control group (FDR = 0.02 and 0.03, respectively). In the pyruvate pathway, (R)-lactate was significantly increased in the neutrophilic group compared to the eosinophilic and control groups (FDR=0.03). There were no significant differences in the remaining pathways.

**Conclusion:**

Nasal swabs can detect metabolomic differences in mucus from patients with disease versus control. Further characterization of these differences in future studies may lead to identification of diagnostic biomarkers in patients with sinusitis.

Poster #064

**Metastatic prostate cancer to the sinuses**

Alexandra Michalowski, MD  
 Ashutosh Kacker, MD

Metastatic cancer to the sinuses is quite rare, accounting for a small proportion of sinonasal neoplasms. Despite the relatively higher prevalence of prostate cancer in the general population, fewer than 30 cases have been reported describing prostate metastases to the sinuses. As is seen with many sinonasal masses, these typically present with nasal symptoms including epistaxis, nasal obstruction, headache as well as orbital symptoms such as diplopia. This case report describes a patient undergoing chemoradiation therapy for prostate cancer who was being treated for presumed sinusitis with rhinitis medicamentosa. Upon subsequent presentation, he reported six weeks of worsening periorbital pressure, nasal congestion, and clear rhinorrhea. Sinus CT showed osseous erosion of the sinuses and he underwent urgent sinus surgery with a tissue diagnosis confirming sinus metastases of his prostate cancer. In the treatment of prostate cancer, metastatic disease is a critical prognostic factor and can guide therapy. At this stage, unless there is a single small focus of metastatic sinus disease, surgical resection of sinus metastases is palliative for control of pain and bleeding. Although metastatic disease is an infrequent etiology of sinonasal symptoms, early detection can make a significant impact on quality of life and help guide treatment options including whether to proceed with palliative resection. As a result, a high degree of suspicion is important in identifying these patients, especially when there is a known history of malignancy.

## POSTERS

Poster # 065  
WITHDRAWN

Poster #066

**Modified technique significantly improves efficacy for in-office posterior nasal nerve ablation**

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Baylor College of Medicine

**Background:**

Posterior nasal nerve (PNN) ablation has emerged as a promising treatment for chronic rhinitis patients refractory to conservative management. Currently, cryotherapy and radiofrequency ablation techniques target the PNN at the posterior middle meatus (PMM) but randomized clinical trials report only a 65% responder rate. Based on recent published data, the relationship between the middle turbinate (MT) and the sphenopalatine foramen, where the PNN enters the nasal cavity, helps predict success of in-office ablation of the PNN. The modified technique proposed utilizes pre-procedural computed tomography (CT) imaging to help predict the PNN location in relation to the MT and PMM and determine the number and location of treatments. The objective of this study was to investigate the efficacy of a modified technique for in-office ablation of the PNN.

**Methods:**

Data was retrospectively collected from 7/2020 until 2/2022. Initiation of the modified technique began in 7/2021. The primary endpoint was patient reported outcomes of improvement in their previously reported nasal symptoms. Patients who report improvement in symptoms were considered responders. Fisher exact test was implemented for statistical analysis.

**Results:**

Prior to modifying the PNN technique, a 65% responder rate was documented. After introducing this new approach to PNN ablation, responder rates were 93% ( $p < 0.05$ ) at 3 months after treatment.

**Conclusion:**

This study depicts improved efficacy with implementation of the modified technique. Given the discrepancy of PNN anatomy, utilizing pre-procedural imaging and multiple treatment sites to address the PNN and its accessory branches can provide customized patient care to optimize results.

## POSTERS

Poster #067

**Musculoskeletal and connective tissue disease in orbital cellulitis**

Anthony M. Saad, BA  
 Aman M. Patel, Medical Student  
 Amar D. Desai, Medical Student  
 Vraj P. Shah, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Rutgers New Jersey Medical School

**Objective:**

Musculoskeletal and connective tissue disease (MCTD) has been associated with poorer outcomes across a variety of medical and surgical procedures. Our study investigates the influence of MCTD on inpatient orbital cellulitis (OC) management.

**Study Design:**

Retrospective database study.

**Methods:**

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary diagnosis of orbital cellulitis (ICD-10: H05.01). Musculoskeletal and connective tissue disease was identified (ICD-10: M00-M99). Univariate and multivariable analyses were used to identify statistical associations with MCTD status.

**Results:**

Of the 2,130 inpatients diagnosed with orbital cellulitis, the majority were female (50.9%), White (62.8%), admitted on a weekday (75.4%), and did not have MCTD (77.0%). Mean patient age was 53.1 years. MCTD patients had higher incidence of chronic pulmonary disease (24.5% vs. 14.0%), fluid and electrolyte disorders (21.4% vs. 14.0%), hypertension (56.1% vs. 40.2%), hypothyroidism (19.4% vs. 8.5%), and obesity (19.4% vs. 13.1%) ( $p < 0.001$ ), but similar incidence of diabetes mellitus (22.4% vs. 24.1%,  $p = 0.455$ ) as non-MCTD patients. On multivariable analyses, adjusting for patient and hospital demographics and several comorbidities, MCTD patients had greater total charges (\$39,169 vs. \$30,911,  $p < 0.001$ ), length of stay (LOS) (4.6 vs. 4.0 days,  $p = 0.022$ ), and number of procedures undergone (1.2 vs. 0.8 procedures,  $p = 0.001$ ) but similar odds for glaucoma (OR 0.91, 95% CI 0.61–1.35,  $p = 0.627$ ) as non-MCTD patients.

**Conclusions:**

In a national cohort of OC, inpatients with MCTD had greater total charges, LOS, and number of procedures undergone than inpatients without MCTD.

Poster #068

**Nasal cytology in patients treated with biologic therapies**

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 Mireia Minguell  
 Eugenia Navarrete, PharmG  
 Maria Martel, MD, PhD  
 Pilar Ausin, MD, PhD  
 Hospital del Mar

**Background:**

Nasal cytology is an accessible diagnostic tool in the management of patients with chronic rhinosinusitis with polyps (CRSwNP). Nowadays in the management of CRSwNP, different biologic therapies can be used. We hypothesized that improvement in symptoms and quality of life after biologic therapy should be reflected in the improvement in the nasal cytology.

**Methods:**

This is a prospective study performed at an academic tertiary medical center from 2019 to 2021. A total of 50 consecutive patients with CRS and asthma candidates for a biological therapy were screened: 30 with two samples of nasal cytology - at baseline and between 6-12 months after treatment initiation- were included. Demographics, medical history, and endoscopy nasal polyp score (NPS) were collected. Sinonasal Outcomes Test-22 (SNOT-22) and visual analog scales (VAS) were administered for assessing the quality of life and symptoms. Asthma Control Test (ACT) was also administered to assess asthma status.

**Results:**

25 patients received an anti-IgE biologic and 25 an anti-IL5 one. The average baseline SNOT-22 score was 43.06 (95% CI, 35.56 to 50.56), and the total impact VAS was 5.52 (95% CI, 4.70 to 6.34). The mean NPS was 2.06 (95% CI, 1.27 to 2.85). Patients treated with an anti-IL5 and higher cytological improvement presented a greater reduction in global VAS. No statistically significant differences were seen regarding SNOT-22, ACT or NPS.

**Conclusions:**

Biologic therapies improve quality of life regardless of the presence of nasal polyps. Interpretation of nasal cytology needs to be standardized to properly assess its utility in monitoring biologic drugs in patients with type 2 inflammation.

## POSTERS

Poster #069  
WITHDRAWN

Poster #070

**Nasal polyps in pediatric chronic rhinosinusitis**

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Amar D. Desai, Medical Student  
Rushi Patel, Medical Student  
Prayag Patel, Fellow  
Jean Anderson Eloy, MD, FARS  
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**Objective:**

Nasal polyps (NPs) have been suggested to influence the management and outcomes of chronic rhinosinusitis (CRS) in adults. Our study investigates the relationship between NPs and the management and outcomes of pediatric patients with CRS.

**Study Design:**

Retrospective database study.

**Methods:**

The 2016 Kids' Inpatient Database (KID) was queried to identify pediatric inpatients with a primary diagnosis of CRS (ICD-10: J32). NP status was identified using ICD-10: J33. Univariate and multivariable analyses were performed to identify statistical associations with NP status.

**Results:**

Of the 744 inpatients diagnosed with CRS, the majority were male (58.7%), White (58.2%), had moderate loss of function (69.5%), and did not have NPs (91.8%). Mean patient age was 9.4 years. NP patients had higher incidence of allergic rhinitis (16.4% vs. 4.5%), cystic fibrosis (50.0% vs. 8.3%), and deviated nasal septum (14.5% vs. 2.8%) ( $p < 0.001$ ) than non-NP patients. On multivariable analyses, adjusting for patient demographics, hospital demographics, and severity of illness, NP patients had greater total charges (\$77,992 vs. \$38,321,  $p < 0.001$ ), length of stay (LOS) (4.9 vs. 3.4 days,  $p = 0.028$ ), and number of procedures undergone (6.8 vs. 1.9 procedures,  $p < 0.001$ ) than non-NP patients. NP patients had greater odds for undergoing ear, nose, or sinus (ENS) excision (OR 9.82, 95% CI 5.29–18.22), drainage (OR 3.88, 95% CI 2.20–6.87), and resection (OR 4.78, 95% CI 2.58–8.82) than non-NP patients ( $p < 0.001$ ).

**Conclusions:**

In a cohort of pediatric inpatients with CRS, patients with NPs had greater total charges, LOS, number of procedures undergone, and odds for ENS excision, drainage, and resection than non-NP patients.



## POSTERS

Poster #071

**Nonresponders to Interleukin-5 Inhibitors in CRSwNP**

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 Michael Marino, MD, FARS  
 University of Arizona College of Medicine – Phoenix

**Background:**

Anti-interleukin-5 (IL-5) therapies can be considered for chronic rhinosinusitis with nasal polyposis (CRSwNP) refractory to other treatments. A subgroup of CRSwNP patients may not have a complete clinical response to IL-5 inhibitors.

**Methods:**

This series included patients with CRSwNP treated between 2019 and 2021 at our institution with anti-IL-5 therapy and endoscopic sinus surgery. Duration of therapy, surgery date, operative pathology report, pre- and post-op Sinonasal Outcome Test (SNOT-22) scores, and post-op clinical course were collected.

**Results:**

Seven patients (2 on mepolizumab, 5 on benralizumab) with CRSwNP were identified. One patient started anti-IL-5 therapy after surgery, while 6 began their therapies at least 3 weeks prior to surgery. Pathology reports of these 6 showed 1 patient had <5 eosinophils per high power field (hpf), 4 patients had <10 per hpf, and 1 patient had 10 to 100 per hpf. Only 1 of these 6 had a decreased SNOT-22 score after surgery and 3 had persistently elevated scores. Following surgery, 5 of the 7 patients transitioned to dupilumab: 2 for polyp recurrence, 2 for recurrence or worsening symptoms, and 1 having discussed this transition prior to surgery. The 2 patients who remained on IL-5 inhibitors both developed acute bacterial exacerbations post-op with eventual recovery.

**Conclusion:**

A subgroup of patients with CRSwNP did not have improvement of patient reported outcome measures with anti-IL5 therapies, even in the setting of low tissue eosinophilia. Careful patient selection may be an important factor in deciding for IL-5 inhibitor therapy in CRSwNP.

Poster #072

**Optimizing success in dacryocystorhinostomy**

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 Tripti Brar, MBBS  
 Amar Miglani, MD  
 Devyani Lal, MD, FARS

**Introduction:**

On systematic review, Leong et al. report that high-volume centers have superior outcomes in endoscopic dacryocystorhinostomy (DCR). This clinical letter shares successful results and pearls from a “low-volume” DCR surgeon who is a rhinologist.

**Method:**

A case series of adults who underwent endoscopic DCR by DL for epiphora secondary to nasolacrimal duct obstruction (NLDO) between 2010-2021 was analyzed. DCR was deemed “successful” if patients met both functional (complete resolution of epiphora) and objective (endoscopically-documented DCR patency) metrics.

**Results:**

Twenty-two patients underwent 26 DCR procedures, of which 65% were primary and 35% revisions for failed external DCR. NLDO was idiopathic in 46% of sides, and chronic dacryocystitis was the surgical indication in 88%. Pre-operative sinus CT was obtained for all patients. Image guidance was used in those with history of prior DCR or sinonasal surgery. Lacrimal stents were placed in all. Concomitant septoplasty was performed in 59% and endoscopic sinus surgery in 32%. No significant complications were noted, and all 26 DCR procedures were successful.

**Discussion:**

Factors critical to success include pre-operative verification of NLDO, wide removal of bone medial to the lacrimal sac, atraumatic probing and dilatation of the upper and lower puncta, tenting and wide filleting of the lacrimal sac’s medial wall, endoscopic verification of passage through the internal os of the common canaliculus, optimization of stent stability, early stent removal, debridement, and diligent post-operative care.

**Conclusion:**

Experienced endonasal surgeons can accomplish consistent success in “low-volume DCR centers” through meticulous patient selection and technique.

## POSTERS

Poster #073

**Osteoradionecrosis of the skull base**

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 Dennis Tang, MD  
 Arthur Wu, MD, FARS  
 Florida International University Herbert Wertheim  
 College of Medicine

## Introduction:

Osteoradionecrosis (ORN) of the skull base is a rare but devastating complication of targeted radiation therapy. Preventative measures and early management can impact overall survival in patients. This systematic review serves as a guide to providers regarding management of ORN of the skull base.

## Methods:

Systematic review with data sources including PubMed, Embase, and Cochrane Library were accessed obtain studies for this review. The inclusion criteria were as follows: studies that treated osteoradionecrosis of the anterior skull base following radiation treatment for head and neck cancers. Patients were assessed on skull base ORN resolution rate based on treatment modality.

## Results:

A total of 20 articles met inclusion criteria. Patients were split into conservative medical treatment versus surgical treatment. Conservative treatment included patients undergoing hyperbaric oxygen therapy, antibiotics, pentoxifylline-tocopherol-clodronate, or a combination of the three. 13 out of 64 patients treated with conservative therapy had resolution of skull base ORN (20.3%). 147 of 194 patients treated with surgical intervention had resolution of skull base ORN (75.8%). The surgical complication rate was 13.8%. Complication rates for conservative treatments were not reported. Meta-analysis is currently being performed with data forthcoming.

## Conclusion:

This is the first systematic review of skull base ORN and compares various treatment modalities' differences in overall survival and long-term complication rates.

Poster #074

**Otolaryngologist perceptions of AI-based CT sinus interpretation**

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 Anu Asokan  
 Caroline Tietbohl  
 Megan Morris  
 Vijay Ramakrishnan, MD, FARS

## Background:

Overcoming non-standardization, vagueness, and subjectivity in sinus CT radiology reports is an ongoing need, particularly in keeping with current healthcare initiatives. Our objective was to explore the utility of quantitative objective disease measures as enabled by deep learning-based analysis, and determine preferences for standardized sinus CT reporting.

## Methods:

Following an ARS member survey, a qualitative approach was undertaken using semi-structured interviews of practicing otolaryngologists and rhinologists from varying backgrounds, practice settings and locations. Interview topics included sinus CT reports, familiarity with AI-based image analysis, and potential requisites for its future implementation. Interviews were transcribed, coded, and analyzed using content analysis.

## Results:

120 ARS members completed surveys, and a total of 19 otolaryngologists (8 rhinologists) were interviewed. Overall, interviewees felt that sinus CT reports had limited utility due to inconsistent content, but were relied on for reporting incidental extra-sinus findings. Reporting could be improved with more detailed anatomical analysis and standardization. Interviewees expressed interest in deep learning-derived disease quantification given increased objectivity and precision, although they desired evidence of accuracy, and could not envision a situation in which AI-analysis would supplant a radiologist's interpretation.

## Conclusions:

Our qualitative approach shows that sinus CT interpretation has significant shortcomings in its current state. Standardization and objectivity could be aided with deep learning-enabled quantitative analysis, although clinicians desire evidence of accuracy and reproducibility to build trust.

## POSTERS

Poster #075

**Outcomes of Dupilumab treatment in patients presenting with severe asthma or CRSwNP, over 65**

Keisha Best, MS

Samiat Awosanya, Research Fellow, Co-investigator

Chandala Chitguppi, Research Fellow,

Co-investigator

Marc Rosen, MD, FARS

Mindy Rabinowitz, MD, FARS

Elina Toskala, MD, FARS, Co-investigator

Gurston Nyquist, MD, FARS, Co-investigator

Jessica Most, MD, Principal Investigator

Thomas Jefferson University Hospital

**Introduction:**

Dupilumab is an IL-4/13 inhibitor that has been implemented in the treatment of severe asthma and chronic rhinosinusitis with nasal polyps (CRSwNP). The safety and efficacy of Dupilumab has not been reported for these indications in patients over the age of 65. This study aims to determine the long-term benefits of dupilumab while detailing adverse effects.

**Methods:**

This study is a retrospective review of patients receiving dupilumab for severe asthma and/or CRSwNP. Charts were reviewed for demographics, Sino-nasal Outcome Test (SNOT-22) scores, asthma control test (ACT) scores, polyp scores, and adverse effects. We reported the findings of patients over 65 whose first biologic was dupilumab.

**Results:**

Thirty-one patients over the age of 65 were identified ( $\bar{x}$  = 72.2), 18 (58.1%) of whom are female. Twelve (38.7%) presented with severe asthma, 7 (22.6%) with CRSwNP and 12 (38.7%) with both severe asthma and CRSwNP. Compared to baseline, there was a significant difference observed within patients in mean ACT (17.8 to 20.3;  $n=13$ ,  $p=0.002$ ), SNOT-22 (40.5 to 23.4;  $n=10$ ,  $p=0.015$ ), and polyp scores (3.06 to 1.13;  $n=8$ ,  $p=0.010$ ) post treatment initiation. Seven (22.6%) reported adverse reactions that may or may not be related to dupilumab. Adverse reactions included ophthalmologic (1), musculoskeletal (1), dermatologic (2) and other (2). Zero reported allergic reactions. Four of the 7 chose to continue dupilumab therapy.

**Conclusion:**

Patients over 65 on dupilumab showed improvement in asthma and CRSwNP symptoms. There were improvements in ACT, SNOT-22, and nasal polyp scores within 9 months of therapy initiation. Most did not experience adverse effects, demonstrating the value of dupilumab treatment in this patient cohort.

Poster #076

**WITHDRAWN**

## POSTERS

Poster #077

**Patient versus provider Twitter perspectives on sinusitis**

Shahzeb Hasan, BS  
 Lydia Weykamp  
 Andrew Strumpf  
 William Swift  
 Spencer Payne, MD, FARS  
 Jose Mattos, MD, MPH

**Introduction:**

Previous studies have shown that sinusitis is well represented on Twitter. We describe the content of sinusitis related tweets between general public (GPA) and healthcare professional (HA) accounts to better characterize the social media discourse of sinusitis.

**Methods:**

314,637 tweets containing the keyword 'sinusitis' from March 2012 to May 2020 were collected. 1000 random sinusitis-tweets per year were analyzed for both GPA and HA respectively. Tweets were categorized into 7 categories: risk factors, awareness, treatment and management (T&M), mechanism, outcomes, symptoms, and quality of life (QOL).

**Results:**

In 9000 GPA tweets the most common category is QOL with 34% of total tweets, often expressing frustration with personal disease experience. Comparatively, QOL accounts for 4% of HA tweets. Instead, the most common category found in 9000 HA posts is T&M (46%), of which 12% mentioned antibiotics, 19% discuss procedures, and 15% mention other medications. In the GPA group, T&M (29%) is the second most common group, with 13% of posts mentioning antibiotics, 6% discussing procedures, and 16% mentioning other medications. The second most common category of HA is mechanism (17%), with posts commonly containing user friendly explanations of pathophysiology. Longitudinal analysis of the HA group shows a steady decrease in T&M from a 52% peak in 2015 to 36% in 2020. In 2017, Mechanism overtook Symptoms as the most second most common HA category and peaked at 22% in 2020, as HA shift their platform towards increased patient education.

**Conclusions:**

Twitter provides an avenue to examine the longitudinal perspectives, goals, and differences between patient populations and providers when discussing sinusitis.

Poster #078

**Pediatric chronic rhinosinusitis with Cystic Fibrosis**

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 Mihir Karande  
 Kent Lam, MD, FARS  
 Joseph Han, MD, FARS  
 Eastern Virginia Medical School

**Background:**

Cystic fibrosis (CF) is a disorder of the CFTR channel, which leads to decreased mucociliary clearance and microbial sinus colonization. Almost all CF patients will develop chronic rhinosinusitis (CRS) by adulthood. Like general CRS, pediatric CRS with CF (PCRSwCF) has been phenotypically classified into patients with and without nasal polyposis (NP). The purpose of this review was to characterize PCRSwCF patients based on exam findings, imaging, and other lab data.

**Methods:**

Reviewers analyzed 107 manuscripts on PCRSwCF from a medical literature database search. Fifty articles were evaluated and 27 articles met the inclusion criteria for this review.

**Results:**

The average age of PCRSwCF diagnosis was 14.4 years. Males accounted for about half of the PCRSwCF population with the range between 41% to 58%. There was a high incidence among white children, but this was region-dependent. The patients had other CF manifestations including liver disease, lung transplant, and pancreatic insufficiency. In terms of microbiology, sinus cultures mainly grew *P. aeruginosa*, *S. Aureus*, or *E. Coli*. Radiographic imaging of PCRSwNP showed an early onset of structural abnormalities in the paranasal sinus development at 8 months. Genetically, in PCRSwNP, there is increased glandular MUC5B expression with hyperplasia; a 1G/2G polymorphism at position 1607 on the MMP1 gene may impact one's predisposition to the PCRS.

**Conclusions:**

Certain phenotypes and endotypes are suggestive of PCRSwCF. White race, paranasal sinus opacification on imaging, and certain gene expression are typical of PCRSwCF and may warrant diagnosis confirmation using sweat chloride test with CF genetic testing.

## POSTERS

Poster #079

**Pediatric retronasopharyngeal abscess causing erosive skull base osteomyelitis**

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ENT Specialists of Illinois

**Background:**

Clival osteomyelitis is an extremely rare finding in the pediatric population which typically arises from contiguous acute sinusitis. Here, we present the case of a seven-year-old who presented with clival osteomyelitis and secondary to an unusually high retropharyngeal abscess.

**Case Report:**

A healthy seven-year-old female presented to the pediatric ED complaining of two days of neck pain. CT scan showed possible atlantoaxial rotary subluxation, and patient was discharged home. She returned five days later with fever and worsening symptoms. MR of the cervical spine demonstrated a large abscess posterior to the nasopharyngeal tissue with erosion of the anterior cortex of the clivus. The abscess grew to 2 x 3 x 3 cm and patient became bacteremic, and thus was taken emergently to the operating room for transoral endoscopic-assisted intervention.

**Discussion:**

With modern antimicrobials, cranial base osteomyelitis in the general population has become an infrequent event. There are few reported instances of retropharyngeal abscess in association with clival osteomyelitis. If unrecognized and untreated, erosive clival disease can lead to severe functional morbidity and mortality. Due to its proximity to neurovascular structures, the surgical approach to treat clival osteomyelitis can be challenging.

**Conclusion:**

In conclusion, clival osteomyelitis as a complication of retropharyngeal abscess is a rare finding in the pediatric population. This case adds to the very limited body of literature on the topic. Further understanding of the risk factors for development and the mechanism of spread may provide guidance for early diagnosis, multidisciplinary care, and minimally-invasive treatment to optimize outcomes.

Poster #080

**Pediatric transnasal odontoid resection: A single institution experience**

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Hasnain Fahad, Student  
Stephen Mendenhall, Resident Physician  
Brian Lobo, MD, FARS  
Virendra Desai, Assistant Professor  
Daniel Fulkerson  
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Indiana University School of Medicine

**Overview:**

Odontoidectomy is used to improve neurological function in patients with compressive disorders of the craniovertebral junction. Endoscopic endonasal approaches can be used to achieve this decompression with fewer airway and swallowing complications than the traditional transoral route. While this has gained acceptance in the treatment of adults, there remains a lack of data on this approach in the pediatric patients, leading to many cases still being performed via a transoral or combined approach. This study seeks to close this knowledge gap by providing the largest reported case series of pediatric transnasal odontoidectomy.

**Methods:**

A retrospective review of all cases of pediatric transnasal odontoidectomy was performed from 2013 to present. Surgical duration, length of stay, surgical technique, complications, need for surgical airway, time to return to baseline feeding, and neurological outcomes were recorded.

**Results:**

Among the four patients reported, average age was 12 years. Average surgical duration was 593.5 minutes. No patients required tracheostomy. All patients extubated successfully and returned to baseline oral intake after an average of 2.25 and 8 days respectively. Average length of stay postoperatively was 7 days. All defects were repaired with absorbable hemostatic agents and fibrin glue ± abdominal fat. One patient had postoperative meningitis. No other complications were observed. All patients improved neurologically at follow-up.

**Conclusions:**

Transnasal odontoidectomy has been successfully performed in our pediatric patients. It enables avoidance of surgical airway, early return to baseline oral intake, and neurological improvement.



## POSTERS

Poster #081

**Pituitary apoplexy and HIV**

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Mandy Salmon, Medical Student  
Rijul S. Kshirsagar, MD  
Jacob G . Eide, MD  
Michael A. Kohanski, MD  
Nithin Adappa, MD, FARS  
James N. Palmer, MD, FARS

**Background:**

Pituitary apoplexy (PA) is a rare, devastating condition resulting from infarction or hemorrhage of the pituitary gland with symptoms including visual changes, chronic endocrinopathies, and hemodynamic instability. A number of conditions are associated with PA, including human immunodeficiency (HIV), however, large-scale studies have not been performed.

**Methods:**

A retrospective cohort study was performed using the TriNetX database. Subjects age >18 years who were treated for PA were included (ICD-code E23.6). Control subjects were healthy adults and disease patients were those carrying a diagnosis of HIV before or within the three months following PA treatment. Two-tailed, unpaired t-tests were performed.

**Results:**

Patients with HIV showed an increased rate of PA (OR 40.0) compared with healthy adults. A total 1,293 patients were included (730 HIV, 563 controls). Among the HIV cohort, patients were more likely younger (mean 48.1+11.6 vs 54.6+16.1,  $p<0.0001$ ) and male (74% vs 33%,  $p<0.0001$ ). Cohorts were propensity matched by age and sex, with 337 patients per cohort. HIV patients showed reduced T4 (4.7 vs 8.6  $\mu\text{g}/\text{dl}$ ,  $p=0.0025$ ) and increased prolactin (22.7 vs 13.6  $\text{ng}/\text{mL}$ ,  $p=0.02$ ). There were no differences in 1-month mortality, visual changes, or other pituitary hormone levels. A total 602 (82.5%) patients did not carry an HIV diagnosis at presentation but were diagnosed at the time of or in the 3 months following PA treatment.

**Conclusion:**

PA is an uncommon condition with the potential for severe harm. There is a significantly increased risk of HIV in PA patients, and these patients tend to be younger and male. We recommend routine HIV testing for patients being treated for PA, particularly in younger, male patients.

Poster #082

**Preoperative laboratory testing in low-risk patients undergoing septorhinoplasty—A NSQIP study**

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Mehdi Lemdani, BA  
Nigar N. Ahmedli  
Jean Anderson Eloy, MD, FARS  
Christina H. Fang, MD

**Objectives:**

This study aims to assess the use of PLTs in low-risk patients undergoing septorhinoplasty and to determine whether its use is associated with postoperative outcomes.

**Methods:**

Low-risk patients undergoing septorhinoplasty were identified from the 2005-2018 National Surgical Quality Improvement Program (NSQIP) database. Low-risk patients were defined as American Society of Anesthesiologists physical classification of 1 or 2. PLTs were grouped into hematologic, chemistry, coagulation, and liver function tests. Demographics, comorbidities, and postoperative complications between PLT and non-PLT cohorts were compared using univariate and binary logistic regression analyses.

**Results:**

Of the 3015 subjects that met inclusion criteria, 1310 (43.4%) underwent PLT. Complete blood cell count was the most common PLT ( $n=1159$ , 38.4%). Postoperative complications were observed in 1.7% of patients without prior PLT, and 1.5% of patients with at least one prior PLT, with no statistically significant difference in complications between the two groups ( $p=.708$ ). Logistic regression controlling for age, sex, and comorbidities demonstrated that the use of PLTs was not a significant independent predictor of superficial ( $p=.892$ ) or deep ( $p=.624$ ) surgical site infection, wound disruption ( $p=.570$ ), readmission ( $p=.978$ ), reoperation ( $p=.702$ ), urinary tract infection ( $p=.229$ ), medical ( $p=.368$ ) or surgical complications ( $p=.913$ ).

**Conclusion:**

Analysis of the use of PLTs in low-risk patients undergoing septorhinoplasty using the NSQIP database found no association with postoperative morbidity. Our data analysis is consistent with the current recommendation against the use of PLTs based on the lack of evidence of improved outcomes.

## POSTERS

Poster #082A

**Presence of the CDHR3 risk allele in CRS patients increases the odds of sinus infections**

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 Sunny Palumbo  
 Joseph Irish  
 Sophia Volpe  
 Hyeon Lee, Undergraduate student  
 Bonnie LaFleur  
 University of Arizona

## Rationale:

Cadherin Related Family Member 3 (CDHR3) is the receptor for Rhinovirus-C and expressed in sinonasal epithelial cells. We have previously determined that the CDHR3 (rs6967330) base change from G to A causes a two-fold increase in the odds of adults with chronic rhinosinusitis (CRS) and that RV-C infections result in increased CRS severity. However, the influence of the rs6967330 SNP on CRS disease is not known.

## Methods:

We genotyped 400 physician diagnosed CRS samples that were collected from the University of Arizona ENT clinics into the risk allele (AG, AA) and wildtype (GG) groups. We selected 20 adults in each group to be evenly distributed with known confounding factors to include: history of asthma, allergic rhinitis, presence of polyps, smoking history, age, sex, and race. We measured disease severity of the 40 patients through a retrospective EMR review between 2016-2019. Patients who presented with a sinus infection were evaluated by a nasal endoscopy and prescribed antibiotics or oral corticosteroids (OCS).

## Results:

Over a 3-year period, 12/40 adults required antibiotics or OCS for a sinus infection. Among the patients who experienced a sinus infection, 10/12 adults were identified of having the risk allele and were documented to have one or more sinus infections.

## Conclusions:

In a retrospective study, CRS patients with the rs6967330 allele had increased rates of sinus infections. In the future, we plan to assess the association between the subtypes of RV infections, disease severity and the presence of the rs6967330 allele in this cohort in a prospective longitudinal study.

Poster #083

**Prevalence and associated factors of cognitive dysfunction in patients with chronic rhinosinusitis**

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 Thomas Blaise Marshall  
 David Cvancara, Medical Student  
 Ian Humphreys, DO, FARS  
 Waleed Abuzeid, MD, FARS  
 Nathan Reeve, Fellow  
 Aria Jafari, MD  
 Geisinger Health System

## Background:

Several recent studies have demonstrated the cognitive effects of CRS. While multiple mechanisms for this have been proposed, the cause of cognitive dysfunction (CD) in CRS is yet unknown. The purpose of this study was to evaluate the prevalence and associated factors of CD in patients with CRS.

## Methods:

Adult patients with CRS were consecutively enrolled upon initial rhinologic evaluation. Clinical and demographic data were collected, including Lund-Kennedy endoscopic and Lund-Mackay imaging scores. Sinonasal quality of life was assessed with the SNOT-22. Comorbidities were evaluated, including depression with the PHQ-2 and anxiety with the GAD-2. CD was assessed using the Neuro-QOL Cognitive Function-Short Form, for which CD is defined as a score  $>1.5SD$  above the general population's mean. Comparisons were made between groups using univariate and multivariate analyses.

## Results:

Of the 129 CRS patients enrolled, 16.3% demonstrated CD. CD was associated with worse quality of life as measured by SNOT-22, self-reported fatigue and altered sense of smell, and poorer scores for anxiety, sleep, and depression ( $p < 0.05$  for all). CD was not associated with polyp status or Lund-Mackay or Lund-Kennedy scores ( $p > 0.05$ ). When controlling for age, gender, disease duration, asthma, depression, and anxiety, CD remained strongly associated with SNOT-22 (OR 1.04).

## Conclusion:

Approximately 1 in 6 patients with CRS experiences CD, which is closely associated with disease severity as measured by SNOT-22. While the putative link between CRS and CD remains elusive, this study suggests that objective measures of local inflammation may not reflect the cognitive impact of CRS. Additional study is needed to evaluate the etiology of CD.

## POSTERS

Poster #084

**Price transparency for outpatient rhinology procedures**

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The University of North Carolina School of Medicine  
Adam Kimple, MD, FARS  
Andrew Olshan, MD

On January 1, 2021, the Center for Medicare & Medicaid Services (CMS) required United States hospitals to release their prices for items and services to better inform patients about what they might pay. We performed a cross-sectional analysis of compliance by otolaryngology residency-affiliated hospitals with the CMS regulation and evaluated the variability in hospital-reported charges for three common rhinology procedures: Nasal endoscopy (CPT code 31231), Maxillary antrostomy (CPT code 31267), and Nasal septoplasty (CPT code 31231). We compared CMS compliance, prices, and density-based clusters of hospitals. While 98% of hospitals disclosed prices, only 55% of hospitals met CMS guidelines for at least one of the three rhinology procedures. Nasal endoscopy, Nasal/sinus, maxillary antrostomy, and nasal septoplasty were included in 28%, 14%, and 26% of shopping tools, respectively. There is wide variability in reported charges of nasal endoscopy, maxillary antrostomy, and nasal septoplasty; \$785 (range, \$156-\$21,449), \$6,723 (range, \$0-\$57,932), and \$6,933 (range, \$0-\$110,956) respectively. Density-based cluster analysis identified variation in clusters of CMS compliant hospitals (California and the North-East region of the United States) and Non-compliant hospitals (West, Midwest, North-East, and Southern United States). Although price transparency is increasing, rhinology patients may have limited ability to shop and compare prices. Further investigation is needed to examine the factors affecting price variation and transparency in rhinology procedures.

Poster #085

**WITHDRAWN**

## POSTERS

Poster #086

**Resident involvement as a predictor of complications in endoscopic sinus surgery**

Bella Onwumbiko, md  
 Christian Soneru, MD  
 Peter Steinwald  
 Charles Riley, MD  
 Tufts Medical Center

**Introduction:**

Endoscopic sinus surgery (ESS) is a commonly performed surgery with approximately 500,000 cases performed annually in the United States and is a critical component of graduate medical education. We aimed to analyze a population-based database to determine if trainee involvement in ESS is associated with post-operative complications.

**Methods:**

A retrospective cohort study on all patients who underwent ESS was performed using the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database from 2005 and 2014. The total sample was divided into cohorts with or without trainee involvement. Demographics, comorbidities, intraoperative events, and 30-day post-operative complications were compared using univariate comparisons and multivariate logistic regression analysis.

**Results:**

A total of 258 cases were identified with 111 cases involving a trainee and 147 cases performed by the attending alone. The trainee group had higher rates of hypertension (44.1% vs 28.6%,  $p=0.01$ ), diabetes (20.7% vs 10.9%,  $p=0.029$ ), and chronic steroid use (9.9% vs 2.0%,  $p=0.06$ ). In univariate analysis, the post-operative rates of surgical complications (7.2% vs 2.0%,  $p=0.042$ ) and overall complications (11.7% vs 4.1%,  $p=0.02$ ) were higher in the trainee cohort. Multivariate logistic regression analysis considering all demographic factors and comorbidities found no difference in medical, surgical, or overall complication rate between the two groups.

**Conclusion:**

ESS remains a critical component of graduate medical education and trainee involvement appears to have no impact on complication rates. Resident involvement in complex cases should be encouraged to improve education without compromising patient care.

Poster #087

**Rethinking invasive fungal rhinosinusitis**

Amanda Bastien, MD  
 Arthur Wu, MD, FARS  
 Dennis Tang, MD

**Introduction:**

Invasive fungal rhinosinusitis (IFS) is a disease with a high mortality rate. Although once considered rare, it is increasing in incidence. Even with the use of the latest antifungal treatments, the prognosis of invasive fungal rhinosinusitis is poor. However, a subset of these patients survive for more than a year. The goal of this study is to determine the patient and disease characteristics that lead to prolonged survival in patients with IFS.

**Methods:**

We performed a case control study comparing patients who survived to 1 year to those who did not with all patients with IFS from January 1st 2000 to January 1st 2021. A retrospective chart review was completed, and analyzed using an independent T test and chi-square test.

**Results:**

A total of 23 patients were included in this study. 15 patients survived to 1 year while 8 patients did not. Patient who presented with nasal discharge had increased survival ( $p=0.02$ ). The presence of angioinvasion ( $p=0.01$ ) and frontal sinus involvement ( $p=0.03$ ) were associated with worse survival. There were trends toward improved survival in patients on chronic corticosteroids and worse survival for those with hematologic malignancies.

**Conclusions:**

Invasive fungal rhinosinusitis has traditionally been thought of as a dichotomy between acute and chronic forms, but there is increasing evidence that the disease should be treated as a spectrum. Our study shows that patients with nasal discharge as the presenting symptom are more likely to survive to 1 year while those with angioinvasion and frontal sinus involvement are more likely to have mortality.

## POSTERS

Poster #088

**Retronasal olfaction in CRS**

Joel James, BS

Ilan Palte

Brandon Vilarello

Lucas Axiotakis

David Gudis, MD, FARS

Jonathan Overvest, MD, PhD

City University of New York School of Medicine

**Background:**

Retronasal olfaction (RNO) refers to the perception of odorants inhaled through the mouth and carried through the nasopharynx to olfactory receptors within the olfactory cleft, thereby contributing to flavor perception. Although orthonasal olfactory dysfunction in chronic rhinosinusitis (CRS) has been widely described, the impact of CRS on RNO is less clear. In this review, we systemically review the available literature to describe the association between CRS and RNO.

**Methods:**

We systematically searched PubMed, Ovid Embase, Web of Science, and the Cochrane Library for studies examining RNO in patients with CRS. The primary outcome of interest was objective psychophysical measurement of olfaction, including characterization of RNO.

**Results:**

We identified 404 unique references that underwent title and abstract review by two independent reviewers, with 52 articles undergoing full-text review and 9 relevant for data extraction. Though outcome measures varied, all included studies demonstrated diminished RNO in patients with CRS. Of 5 studies evaluating the relationship between retronasal and orthonasal olfactory test scores in CRS patients 3/5 (60%) demonstrated an association between both forms of olfaction and CRS.

**Conclusions:**

Based on the current literature, CRS patients appear to have diminished RNO, which may correlate with orthonasal olfactory dysfunction in this population. Higher level of evidence studies is required to further elucidate these relationships and the impact of medical and surgical intervention on RNO.

Poster #089

**Retrospective study of angiofibroma**

Mohsen Naraghi, MD, FARS

Dr. Naraghi Rhinology &amp; Facial Plastic Surgery Clinic

**Introduction:**

This article retrospectively analyzed and discussed patients who have undergone surgery in the past 10 years in a university referral center.

**Methods:**

A cross-sectional retrospective study was carried out using data from a review of the medical records of 120 male patients with histologically confirmed as having JNA, who underwent surgery in a referral university hospital between 2010 and 2020, were retrospectively reviewed.

**Results:**

Pre-operative embolization was performed in 52.5 % of cases with a median of 2 days before surgery. There was no significant relationship between embolization and tumor recurrence ( $p=0.806$ ). No residues were detected in 88.3 % of patients. The most common sites for tumor residue were intracranial sites (cavernous sinus, carotid artery) with 35.7 % of cases. The other sites were pterygopalatine fossa in 14.3 %, sino-nasal residue in 14.3%, skull base residue in 14.3 %, para-pharynx in 7.1 %, petrous bone in 7.1 % and retro-pharynx in 7.1 %. There was a trend towards tumor residue in higher stages. Involved anatomic locations of angiofibromas in patients with recurrence were sphenopalatine region in 3, orbit in 2, infratemporal fossa in 4, skull base in 5, and middle cranial fossa in 6.

**Conclusion:**

The recurrence rate was associated with the advanced tumor stage at the time of diagnosis and intracranial extension of the tumor. All patients with intracranial involvement should be followed more closely. Preoperative selective arterial embolization is used to reduce bleeding during surgery, but it has nothing to do with tumor recurrence rate.



## POSTERS

Poster #090

**Rhino sinusitis in hematopoietic stem cell transplant patients**

Yi-Tsen Lin, MD

National Taiwan University Hospital

Yen-Hui Lee

Chih-Feng Lin, Dr.

Huai-Hsuan Huang

Te-Huei Yeh, Prof.

**Background:**

Rhinosinusitis is a crucial issue in treating hematologic patients receiving hematopoietic stem cell transplantation (HSCT). We reviewed these cases and their outcomes in search of the guidance of management for rhinosinusitis in patients receiving HSCT.

**Methods:**

The retrospective cohort study included consecutive hematologic patients receiving HSCT and diagnosed with rhinosinusitis across a ten-year period (from April 2011 to April 2021). We collected detailed data on the demographics, the smoking status, the hematological diseases, and the types of rhinosinusitis for descriptive analysis. Additionally, we investigated the determining factors of the unresolved sinus disease and the overall survival.

**Results:**

There was a total of 1553 patients receiving HSCT, and 85 of them diagnosed as rhinosinusitis. Fifty-eight of them patients were included in this study, and chronic rhinosinusitis was the predominant type of rhinosinusitis. Fungal sinusitis was diagnosed only in 9 (16%) patients and invasiveness did not present. The multivariable logistic analysis indicated that the smoking status, the presence of chronic rhinosinusitis and the endoscopic sinus surgery were independent prognostic factors for the control of rhinosinusitis. After controlling the age, the smoking status, types of HSCT and the remission status, fungal sinusitis remained significantly associated with a worse survival.

**Conclusions:**

The epidemiology of rhinosinusitis among hematologic patients receiving HSCT evolved with the usage of antimicrobials. Endoscopic sinus surgery is an effective management to control rhinosinusitis, and fungal sinusitis may deserve an early intervention.

Poster #091

**Risk factors of venous thromboembolism following endonasal endoscopic skull base surgery**

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Eric H. Abello, MD

Jonathan C. Pang, BA

Dean Chung, BA

Arash Abiri, BS

Frank P. K. Hsu, MD, PhD

Edward Kuan, MD, FARS

University of California, Irvine

**Background:**

Bedrest following endoscopic endonasal approach (EEA) for skull base pathology is often part of conservative postoperative management. However, prolonged periods of inactivity increase risk of venous thromboembolism (VTE). In this study, we report VTE incidence and assess for associated risk factors in patients undergoing EEA.

**Methods:**

Retrospective chart review was conducted at a tertiary academic medical center for patients undergoing EEA with primary repair between July 2018 and October 2021. Basic demographic data was collected, as well as length of bedrest, presence of lumbar drain (LD), and use of prophylactic anticoagulation. Incidence of VTE during hospital stay was recorded and analyzed using univariable and multivariable regression.

**Results:**

104 patients, all of whom had intraoperative CSF leaks repaired, were included in the final analysis. Patients were on bedrest for an average of  $3.2 \pm 3.0$  days and for those patients with LD, average drainage duration was  $2.1 \pm 1.0$  days. 75.8% (75/104) of patients received postoperative chemical anticoagulation. Overall incidence of VTE during hospital stay was 3.8% (4/104), which all occurred in those who were not anticoagulated. Age ( $p=0.55$ ), sex ( $p=0.33$ ), BMI ( $p=0.62$ ), standard vs extended skull base approach ( $p=0.90$ ), high vs low-flow CSF leak ( $p=0.77$ ), duration of bedrest ( $p=0.50$ ), and presence of LD ( $p=0.88$ ) were not significant predictors of postoperative VTE incidence on multivariable analysis.

**Conclusion:**

Chemical anticoagulation use, duration of bedrest, and LD use were not significant predictors of postoperative VTE development. Accurate assessment of VTE risk in patients undergoing EEA requires attention to the broader clinical context and patient comorbidities.

## POSTERS

Poster #092

**Risk of inpatient epistaxis admission related to oral anticoagulation medication sse**

Margaret Mitchell, MD, MS-HPed

Alan Workman, MD

Richard Lu, Medical Student

Neil Bhattacharyya, MD

Harvard Medical School

## Objective:

Determine if anticoagulation, particularly with novel oral anticoagulants, is associated with a higher risk of inpatient epistaxis admission.

## Study design:

Case-control study.

## Methods:

Adult patients admitted with a principal diagnosis of epistaxis in 2019-2021 were identified; cases occurring after sinonasal surgery were excluded. A control group of patients matched 1:1 for age, sex, race and medical comorbidities without any admissions for epistaxis was also identified. For both the case and control cohorts, the presence or absence of an oral anticoagulant was identified. Oral anticoagulants were classified as vitamin K inhibitors, direct oral anticoagulants (DOAC) or platelet inhibitors. The frequency of anticoagulant prevalence in the case and control cohorts was compared and odds ratios were computed.

## Results:

158 adult (mean age, 65.3 years; 37.3 % female) unique inpatient admissions with a principal diagnosis of epistaxis were identified and matched to a control. Among the inpatient epistaxis group, 11.4% were utilizing oral anticoagulation versus 8.2% in the control group ( $p=0.45$ ). Among subgroups, vitamin K inhibition was present in 5.7% of cases versus 0.6% of controls ( $p=0.02$ ; OR 9.48, range 1.19-75.77), DOACs were present in 4.4% of cases versus 5.1% of controls ( $p=1.0$ ) and platelet inhibitors were present in 2.5% of cases versus 3.8% of controls ( $p=0.75$ ).

## Conclusions:

Unlike DOACs and platelet inhibitors, vitamin K inhibitors seem to be associated with higher likelihood of epistaxis requiring admission. Otolaryngologists may need to more aggressively manage epistaxis in patients taking vitamin K inhibitors, or advocate for alternate oral anticoagulants to decrease serious bleeding risks.

Poster #093

**Sex in acute rhinosinusitis**

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Vraj P. Shah, Medical Student

Amar D. Desai, Medical Student

Keshav D. Kumar, Medical Student

Prayag Patel, Fellow

Jean Anderson Eloy, MD, FARS

Rutgers New Jersey Medical School

## Objective:

Patient sex has been demonstrated to influence the management and outcomes of several diseases. Our study investigates the relationship between patient sex and the management and outcomes of inpatient acute rhinosinusitis (ARS).

## Study Design:

Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis of ARS (ICD-10: J01). Univariate and multivariable analyses were used to identify statistical associations by patient sex.

## Results:

Of the 4,390 inpatients identified, the majority were female (58.5%), White (70.6%), and had Medicare (50.8%). Mean patient age was 59.1 years. Males had higher incidence of sleep apnea (12.1% vs. 4.7%), nasal polyps (4.1% vs. 1.9%), and deviated nasal septum (4.7% vs. 2.5%) but lower incidence of asthma (9.6% vs. 18.3%), hypothyroidism (8.2% vs. 20.4%), and chronic pulmonary disease (22.3% vs. 32.7%) than females ( $p<0.001$ ). On multivariable analyses, adjusting for demographics and several comorbidities, males had greater total charges (\$44,517 vs. \$37,029,  $p<0.001$ ) and length of stay (LOS) (4.1 vs. 3.7 days,  $p=0.002$ ) but similar number of procedures undergone (1.2 vs. 1.0 procedures,  $p=0.175$ ) and time from admission to first procedure (1.6 vs. 1.8 days,  $p=0.563$ ) as females. Males had greater odds for orbital (OR 2.33, 95% CI 1.61-3.36) and intracranial complications (OR 2.49, 95% CI 1.38-4.49), sepsis (OR 3.12, 95% CI 1.43-6.80), and respiratory failure (OR 1.67, 95% CI 1.14-2.47) but lower odds for urinary tract infection (OR 0.29, 95% CI 0.17-0.52) than females ( $p<0.01$ ).

## Conclusions:

In an inpatient ARS cohort, males had greater total charges, LOS, and odds for several complications than females.

## POSTERS

Poster #094

**Sinonasal complications of SARS-CoV-2: A single center case series**

Eric Lee

Wesley Stepp, Resident Physician

Keonho Kong, Clinical Fellow

Mark Chaskes, Clinical Fellow

Carolyn Quinsey, Dr.

Charles Ebert, Jr., MD, FARS

Brian Thorp, MD, FARS

Brent Senior, MD, FARS

Adam Kimple, MD, FARS

**Background:**

The emergence of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has resulted in an unprecedented global pandemic. Most infections are either asymptomatic or with mild respiratory infection symptoms. However, life-threatening sequelae have been observed. In this report, we reviewed seven cases of severe complications from sinonasal disease in the setting of acute SARS-CoV-2 infection.

**Methods:**

A retrospective chart review was performed of patients admitted to a tertiary hospital with complex sinonasal symptoms that required otolaryngologic evaluation and management in the setting of concomitant SARS-CoV-2 infection.

**Results:**

Seven patients, ranging in age from three to 48, with sinonasal disease and SARS-CoV-2 infection were identified. Presentations ranged from asymptomatic infection to more severe sequelae including epistaxis, proptosis, or neurologic changes. SARS-CoV-2 tests were positive from one to 12 days after symptom onset, with two patients receiving SARS-CoV-2 directed treatment. Sinonasal complications included bilateral orbital abscesses, suppurative intracranial infection, cavernous sinus thrombosis, hematogenous spread with systemic abscess development, and hemorrhagic adenoidal tissue. Six of seven patients (85.7%) required operative intervention.

**Conclusion:**

Though most SARS-CoV-2 infections are asymptomatic and/or self-limited, there is significantly morbidity and mortality in patients with severe disease sequela as outlined in our reported cases. This suggests early identification and treatment of sinonasal disease in this patient population is critical to minimizing poor outcomes. Further research on the pathophysiology of these atypical presentations is needed.

Poster #095

**Sinus and skull base anatomic tool for junior trainees**

Anirudh Saraswathula, MD, MS

Shirley Li, Student

Juan Garcia, Associate Professor

Nicholas Rowan, MD

Johns Hopkins University School of Medicine

**Objective:**

Understanding the complex three-dimensional (3-D) anatomy of the nasal cavity, paranasal sinuses, skull base, and their surrounding structures is an essential undertaking for otolaryngology trainees. The learning curve to understand these anatomic relationships is steep and increasingly challenging in an era of 2-D virtual learning and endoscopic techniques demanding a high level of understanding even for foundational procedures. There does not exist an effective teaching tool at the junior resident or medical student level that allows learners to see and manipulate these structures in 3-D.

**Methods:**

Using Adobe Photoshop, Cinema 4D, and ZBrush, surgical and medical illustration teams collaborated to develop this tool that combines schematic representation of relevant anatomy with corresponding radiologic and endoscopic images. This was then incorporated into a web application using the Unity framework.

**Results:**

We have created an online-compatible fully manipulatable schematic 3-D representation of the nasal cavity, paranasal sinuses, and anterior skull base that is capable of anatomic layering. This schematic is presented alongside representative de-identified radiologic images and surgical videos to demonstrate the correlation of the structures on the diagram to clinically relevant radiologic and endoscopic anatomy.

**Conclusion:**

This online-compatible sinus anatomy teaching tool is created for trainees in otolaryngology and provides an immersive and interactive user experience. With rigorous content validation forthcoming, this tool offers a low-cost and highly-accessible modality capable of demonstrating complex anatomical relationships to junior trainees learning sinus and endoscopic endonasal skull base surgery.

## POSTERS

Poster #096

**Sinus involvement in chronic rhinosinusitis**

Aman M. Patel, BS  
 Vraj P. Shah, Medical Student  
 Amar D. Desai, Medical Student  
 Rushi Patel, Medical Student  
 Prayag Patel, Fellow  
 Jean Anderson Eloy, MD, FARS  
 Rutgers New Jersey Medical School

## Objective:

Management of chronic rhinosinusitis (CRS) has been suggested to vary by sinus location. Our study compares the management and outcomes of inpatients presenting with maxillary and sphenoid CRS.

## Study Design:

Retrospective database study.

## Methods:

The 2017 National Inpatient Sample (NIS) was used to identify adult inpatients with a primary diagnosis related to maxillary or sphenoidal CRS (ICD-10: J32.0 and J32.3, respectively). Univariate and multivariable analyses were used to identify statistical correlations with CRS location.

## Results:

Of the 520 inpatients identified, 380 (73.1%) and 140 (26.9%) had maxillary and sphenoidal CRS, respectively. Most inpatients were female (67.3%) or White (74.3%). Mean patient age was 59.9 years. Sphenoidal CRS patients had higher incidence of congestive heart failure (21.4% vs. 5.3%), hypothyroidism (25.0% vs. 10.5%), allergic rhinitis (7.1% vs. 1.3%), and osteomyelitis (7.1% vs. 0.0%) but lower incidence of diabetes mellitus (10.7% vs. 23.7%) than maxillary CRS patients ( $p < 0.015$ ). On multivariable analyses, adjusting for patient demographics and various comorbidities, sphenoidal CRS patients had greater total charges (\$41,207 vs. \$31,626,  $p < 0.001$ ), length of stay (LOS) (3.1 vs. 2.6 days,  $p = 0.005$ ), and odds for visual disturbances (OR 6.70, 95% CI 1.45–30.94,  $p = 0.015$ ), sleep apnea (OR 2.94, 95% CI 1.38–6.28,  $p = 0.005$ ), and undergoing ear, nose, and sinus (ENS) excision (OR 2.60, 95% CI 1.41–4.78,  $p = 0.002$ ) but lower odds for undergoing ENS drainage (OR 0.30, 95% CI 0.11–0.83,  $p = 0.021$ ) than maxillary CRS patients.

## Conclusions:

In an inpatient CRS cohort, total charges, LOS, and odds for visual disturbances, sleep apnea, ENS excision, and ENS drainage varied by sinuses involved.

Poster #097

**Sinus involvement in pediatric acute rhinosinusitis**

Joel Feier, BA  
 Larner College of Medicine  
 Aman M. Patel, Medical Student  
 Vraj P. Shah, Medical Student  
 Amar D. Desai, Medical Student  
 Prayag Patel, Fellow  
 Jean Eloy, MD, FARS

## Objective:

Sinus location has been suggested to influence complications in acute rhinosinusitis (ARS). Our study compares the management of maxillary, ethmoidal, and frontal ARS in pediatric inpatients.

## Study Design:

Retrospective database study.

## Methods:

The 2016 Kids' Inpatient Database (KID) was used to identify inpatients with a primary diagnosis of ARS (ICD-10: J01). Univariate and multivariable analyses were used to identify statistical associations by ARS location.

## Results:

Of the 418 inpatients identified, ARS location was most frequently maxillary (58.3%), ethmoidal (24.5%), or frontal (17.2%). Mean patient age was 10.0 years old. The majority of patients were male (66.9%) and White (60.1%). On multivariable analyses, adjusting for patient and hospital demographics and severity of illness, ethmoidal ARS patients had greater total charges (\$41,624 vs. \$29,950,  $p = 0.001$ ) and odds for orbital and intracranial complications (OR 5.56, 95% CI 2.96–10.46,  $p < 0.001$ ) and undergoing ear, nose, and sinus excision (OR 2.45, 95% CI 1.34–4.47,  $p = 0.004$ ), drainage (OR 2.57, 95% CI 1.43–4.61,  $p = 0.002$ ), and resection (OR 2.92, 95% CI 1.24–6.87,  $p = 0.014$ ), but had similar length of stay (LOS) (3.9 vs. 3.4 days,  $p = 0.228$ ) as maxillary ARS patients. Frontal ARS patients had greater total charges (\$67,061 vs. \$29,950,  $p < 0.001$ ), LOS (5.9 vs. 3.4 days,  $p < 0.001$ ), number of procedures undergone (2.8 vs. 1.4 procedures,  $p = 0.001$ ), and odds for osteomyelitis (OR 13.97, 95% CI 4.76–40.98,  $p < 0.001$ ) and orbital or intracranial complications (OR 2.19, 95% CI 1.05–4.57,  $p = 0.038$ ) than maxillary ARS patients.

## Conclusions:

In a cohort of pediatric ARS inpatients, total charges, LOS, procedures undergone, and complications varied by sinuses involved.

## POSTERS

Poster #098

**Sinus surgery versus biologic therapy in CRSwNP patients**

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Shireen Samargandy  
University of Arizona

Functional Endoscopic Sinus Surgery (FESS) and biologic therapies have been shown to improve patient symptoms, reduce nasal polyp size, and improve olfaction in CRSwNP patients. However, to our knowledge, there no direct comparison studies between these two therapies in the CRSwNP population. Our goal was to compare the results of a single institution study utilizing standardized measures over the course of 6 months in CRSwNP patients. Inclusion criteria require CRSwNP adult patients with Nasal Polyp Score (NPS)  $\geq 4$  and stable dose of intranasal corticosteroid. Exclusion criteria require patients not to have used a biologic therapy, history of autoimmune diseases, cystic fibrosis, or malignancies. These patients were evaluated for both subjective and objective measures. Subjective measures: University of Pennsylvania Smell Identification Test (UPSIT) and 22-item Sinonasal outcome test (SNOT-22). Objective measures: Nasal polyp score (NPS). 5 patients were recruited in each group. As expected, NPS scores in the FESS group immediately went to zero after surgery. Surprisingly, patients in biologics group gradually decreased and by 6-months were also to zero. In both groups, SNOT-22 scores significantly decreased at 3-months, but the overall minimal clinical important difference (MCID) was greater in the FESS group at 3 and 6 months. In both groups UPSIT scores improved however, the scores improved significantly in the FESS group at 3-months while the biologic groups improved greater at 6-months. Within 6 months of therapy, similar findings were seen in both groups, yet biologics do take a little longer to observe these results. Based on these trends, we anticipate that  $\geq 1$  year follow-up will be necessary to identify major differences.

Poster #099

**Sleep apnea in epistaxis**

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Aman M. Patel, Medical Student  
Vraj P. Shah, Medical Student  
Amar D. Desai, Medical Student  
Prayag Patel, Fellow  
Jean Anderson Eloy, MD, FARS  
Larner College of Medicine

Objective:

Sleep apnea (SA) has been associated with poorer outcomes across a variety of medical and surgical procedures. Our study investigates the influence of SA in the management and outcomes of adult inpatients with epistaxis.

Study Design:

Retrospective database study.

Methods:

The 2017 National Inpatient Sample (NIS) was queried to identify adult inpatients with a primary diagnosis of epistaxis (ICD-10: R04.0). SA was identified (ICD-10: G47.3). Univariate and multivariable analyses were performed to identify statistical associations with SA status.

Results:

Of the 10,720 epistaxis inpatients identified, the majority were male (53.0%), White (68.8%), and did not have SA (89.2%). Mean patient age was 68.4 years. SA patients had higher incidence of congestive heart failure (37.9% vs 23.2%), chronic pulmonary disease (37.5% vs. 26.6%), hypertension (88.4% vs. 78.1%), obesity (32.3% vs. 10.9%), diabetes with chronic complications (30.6% vs 16.1%), and renal failure (35.8% vs. 23.2%) than non-SA patients ( $p < 0.001$ ). On multivariable analysis, adjusting for patient demographics, hospital data, and severity of illness, SA patients had greater total charges than non-SA patients (\$50,628 vs. \$39,286,  $p = 0.013$ ). SA patients had similar length of stay (LOS) (3.7 vs 3.4 days,  $p = 0.475$ ), number of procedures undergone (2.2 vs 1.9 procedures,  $p = 0.161$ ), and odds for undergoing bleeding control of the head, neck, and respiratory tract (HNR) (OR 1.0, 95% CI 0.88–1.20,  $p = 0.737$ ) and nasal packing (OR 1.10, 95% CI 0.94–1.20,  $p = 0.306$ ) as non-SA patients.

Conclusions:

In a national adult epistaxis cohort, SA patients had greater total charges but similar odds for undergoing HNR bleeding control and nasal packing as non-SA patients.



## POSTERS

Poster #100

**Social determinants of health (SDoH) and sino-nasal outcome test (SNOT-22) scores**

Taylor Cave  
 Celina Virgen, BS  
 Michael Marino, MD, FARS

**Background:**

Social Determinants of Health (SDoH) are economic and social factors that influence patient prognosis and outcomes. The effect of SDoH in patients with chronic rhinosinusitis (CRS) is not well known, as previous studies have reported varied results. In this study, we investigated the relationship between SDoH and Sino-Nasal Outcome Test (SNOT-22) scores.

**Methods:**

Patients presenting to a tertiary rhinology clinic for initial consultation during 2020 were considered for study inclusion. Inclusion criteria included diagnosis of CRS, as well as completion of SNOT-22 & SDoH questionnaires at the initial visit. Patient progression to surgical intervention was also examined. The data was analyzed using student's t-test, chi squared analysis, or negative binomial regression, per the nature of the data.

**Results:**

284 patients met inclusion criteria. Patients categorized as high-risk for stress-related factors had significantly higher SNOT-22 scores ( $p < 0.001$ ). Patients with nasal polyps, allergic fungal rhinosinusitis, and those categorized as high risk for dental-related factors were significantly more likely to progress to surgical intervention ( $p = 0.0074, 0.0054, 0.026$ ).

**Conclusion:**

CRS can cause a significant burden on quality of life, which can further be exacerbated by SDoH factors. These data suggest that certain high-risk categorizations of stress-related SDoH risk factors are correlated with higher SNOT-22 scores; however, classification into said category did not affect a patient's progression to surgical intervention. Patients with history of nasal polyps, AFRS and/or a high-risk dental-related SDoH factors were significantly more likely to progress to surgical intervention.

Poster #101

**Social media perceptions on the rhinology industry**

David Moffatt  
 Nicholas Rossi, MD  
 Katherine Lees, MD  
 Farrah Siddiqui, MD

**Background:**

The field of rhinology has soared in recent years with the introduction of revolutionary medical devices that have proven to be beneficial for patients with many common rhinologic ailments. Social media platforms are impactful mediums that not only serve as relevant information sources for the lay public but also provide a portrayal of how the new rhinology tools are perceived by individuals worldwide.

**Methods:**

A preliminary search of posts on Facebook and Instagram was conducted to capture some of the most utilized devices by rhinologists using the following hashtags: #sinuva, #clarifix, #latera, #vivaer, #rhinaer, #balloonsinuplasty, and #eustachiantubedilation. Posts were categorized based upon perspective, media type, timeframe, topic, tone, and popularity.

**Results:**

The preliminary analysis included 350 posts from Facebook and Instagram. Generally, the majority of Facebook and Instagram posts were made by physicians (83% and 81%, respectively) with medical companies representing most of the remaining posts recorded (13% on Facebook and 14% on Instagram). Facebook posts largely consisted of advertisements (51%) and informational content (36%), and Instagram was noted to have a similar trend of these same topics (49% advertisements and 25% informational content).

**Conclusions:**

With increased utilization of medical devices and industry products by the rhinology community, surgeons, typically with private practice accounts, have utilized social media to increase public education and to further develop their clinical practice. Awareness and careful interpretation of these social media posts can provide valuable insight into the impact these posts can have on both patients and surgeon colleagues alike.

## POSTERS

Poster #102

**Socioeconomic disparities in the treatment and survival of sinonasal malignancies after surgery**

Lena Kheir, BA  
Rutgers New Jersey Medical School  
Prayag Patel, MD  
Jean Anderson Eloy, MD, FARS

**Objective:**

This study aims to investigate socioeconomic disparities in resected primary sinonasal malignancies.

Study Design: Retrospective review.

**Methods:**

The 2004-2016 National Cancer Database (NCDB) was queried for cases of surgically- resected primary malignancies. Kaplan-Meier and Cox Proportional Hazards analyses of demographic factors was conducted. 5-year overall survival (OS) was reported.

**Results:**

616 cases of resected sinonasal malignancies were identified. 62.0% were male. Ages ranged from 40 to 90 years old. 85.7%, 12.3%, 1.79% identified as White, Black, and Asian, respectively. 4.4% patients identified as Hispanic. 79.1% lived in metropolitan areas. In zip codes where  $\geq 17.6\%$  did not complete high school, OS was the highest at 60.3%, compared to areas where 6.3-10.8% of the population did not complete high school and OS was the lowest (32.8% OS;  $p = 0.004$ ).

There was no difference across sex, race, ethnicity, income, and level of urbanization. Those between 40-49 years old had higher OS than those over 80 years old (65.3% vs. 12.9%;  $p < 0.001$ ; HR 4.04  $p < 0.001$ ). Nasal cavity tumors had the highest OS when stratifying for education by quartile (69.1% in  $\geq 17.6\%$  no HS completion;  $p = 0.014$ ). Ethmoid sinus tumors had the highest OS in 10-17% no HS (62.9% OS;  $p = 0.048$ ). There was no difference in OS based on race, but when stratifying by insurance status, uninsured White patients had higher OS than uninsured Black patients (47.6% vs. 28.6%;  $p = 0.011$  and  $p = 0.012$ , respectively).

**Conclusions:**

In resected sinonasal malignancies, age is inversely related to survival. High school completion is inversely related to survival, especially in nasal tumors. Uninsured White patients had higher survival than uninsured Black patients.

Poster #103

**Solitary neurofibroma of the posterior septum**

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Valeria Lagunes-Costales, MD  
Hospital Espanol de Mexico

**Background:**

Solitary neurofibroma is a benign tumor that develops when autonomic fibers reach the septum. About 25 to 45% of neurofibromas occur in the head and neck region and only 4% involve the nasal cavity and paranasal sinuses (mainly in the turbinates or maxillary sinus). There is no sex predilection for neurofibromas and they commonly occur in the third or fourth decade of life. Solitary neurofibroma is one of the rare benign sinonasal tumors. A septal location is exceptional. Previously, only 5 patients have been reported with this localization of a solitary neurofibroma. It has a potential of malignancy transformation around 2.6%, and it ranges between 3 and 15% in patients with neurofibromatosis.

**Case presentation:**

A 63-year-old man presented with longstanding right-sided nasal obstruction, progressing to bilateral nasal obstruction 6 months prior to examination. No other sinonasal symptoms were reported.

On nasal endoscopy, a smooth-surfaced mass, located on the posterior septum in the right nasal cavity. Measuring approximately 2x2cm. A significant septal deviation was found ipsilaterally.

A contrast CT was performed, showing a homogeneous soft tissue density mass arising from the posterior nasal septum, no contrast uptake.

An endoscopic endonasal excision of the mass was performed, assisted with monopolar energy, taking margins of adjacent lesion-free septal mucosa.

The histological findings reported spindle-shaped cells with no abnormal mitotic activity, immunoreactivity of S-100 protein, SOX 10, and CD34, which is characteristic of neurofibroma.

We present the 6th reported case in the literature of a solitary neurofibroma arising from the septum.

## POSTERS

Poster #104

**Staphylococcus aureus pathoadaptation in chronic rhinosinusitis**

Ghais Houtak, MD

## Objective:

Staphylococcus aureus nasal colonisation is associated with chronic rhinosinusitis (CRS), a common disease affecting the paranasal sinuses. A better understanding of *S. aureus* persistence and pathoadaptation in CRS is required towards the development of better strategies for nasal decolonization. We studied a longitudinal collection of *S. aureus* clinical isolates from CRS patients assessing their genomic relatedness and phenotypical resistance/tolerance.

## Methods:

Two *S. aureus* clinical isolates were harvested from the sinonasal cavities at different time points from the same patient (n=34), followed by genomic sequencing of the isolates. The relatedness of the isolate pairs was analysed based on single nucleotide polymorphism (SNP) divergence in core genome. Furthermore, the phenotype regarding planktonic resistance and biofilm tolerance was assessed for commonly prescribed antibiotics for all pairs.

## Results:

A total of 68 *S. aureus* were isolated from 34 CRS patients (mean time between harvest = 18 months). Genomic analysis showed that 38% (13/34 pairs) were identical (persisters) over time whilst 62% (21/34) pairs changed over time (non-persisters). However, the biofilm tolerance against all 7 tested antibiotics significantly increased over time for persisters. ( $p < 0.001$ ). Furthermore, at a concentration of 1.25 mg/L mupirocin showed a significant reduction of biofilm viability of more than 50% for most clinical isolates.

## Conclusion:

Our results indicate that *S. aureus* persistence in CRS patients is accompanied with increased biofilm tolerance to antibiotics, likely as part of a pathoadaptive process. Moreover, mupirocin could play a role in reducing the *S. aureus* biofilms in CRS patients.

Poster #105

**WITHDRAWN**

## POSTERS

Poster #106

**Surgical completeness in AERD patients**

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Doron Sommer

Andrew Thamboo, MD

John Lee, MD

St. Michael's Hospital, Unity Health Toronto, U

## Introduction:

Recalcitrant aspirin exacerbated respiratory disease (AERD) in patients who have had sinus surgery remains a challenge. Aspirin desensitization and biologics are additional treatment options. It remains unclear if these patients require “adequate” surgery prior to implementing such additional therapies. The purpose of this study was to quantify prior surgery completeness in AERD patients at a tertiary rhinology practice.

## Methods:

Paranasal sinus CT scans were reviewed by four fellowship trained rhinologists to assess surgery completeness. Using a published CT grading system, each sinus was graded on the completeness of surgery and middle turbinate reduction. A score out of 14 was calculated for each patient (7 per side).

## Results:

61 patients with AERD out of 141 available were included. We excluded patients whose prior scans were not available or who did not have prior surgery. Patients' (27M: 34F) ages ranged from 24-77 years (mean = 57). The mean Lund-Mackay score was 20.1. Mean inter-rater agreement across all sinuses was moderate ( $k = 0.42$ ). The mean completeness score was 6.7/14. The following procedures were rated as completed (means): uncinectomy (L: 84%, R: 82%,  $k = 0.44$ ), maxillary (L: 83%, R: 77%,  $k = 0.32$ ), middle turbinate reduction (L: 45%, R: 46%,  $k = 0.31$ ), anterior ethmoid (L: 35%, R: 39%,  $k = 0.51$ ), sphenoid (L: 36%, R: 35%,  $k = 0.4$ ), posterior ethmoid (L: 30%, R: 30%,  $k = 0.48$ ), frontal (L: 22%, R: 21%,  $k = 0.46$ ).

## Conclusion:

Surgical openings from prior surgery in AERD patients were mostly deemed incomplete. Uncinectomy and maxillary antrostomy are the most common procedures previously performed. It remains to be seen whether additional “complete” surgery would provide greater disease control.

Poster #107

**Surgical management of orbital lesions associated with GPA: Case report**

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Amnie Ashour, Dr.

Sonya Marcus, MD

Stony Brook Medicine

Granulomatosis with polyangiitis (GPA) is an inflammatory disease affecting small and medium sized blood vessels that can manifest with a range of rhinologic and ocular symptoms. Orbital involvement, occurring in 45% to 65% of patients, is typically responsive to immunosuppressive therapy. However, surgical decompression may be indicated with acute ocular deterioration. We present the case of a 37-year old male with GPA and long-standing bilateral medial orbital masses causing diplopia and gaze-restrictions over time despite medical management, requiring surgical decompression. The patient was diagnosed with GPA 15 years prior, noted to have asymptomatic orbital masses at that time, which remained stable in size on serial imaging. However, within the past year the patient developed an acute worsening of his left vision, despite control of the other manifestations of his disease with immunosuppressive therapy and steroids. Given the medial nature of the lesion, a combined endoscopic and open decompression of the left orbit was performed with partial excision of the mass, resulting in near complete resolution of his ocular symptoms. This case demonstrates that surgical decompression is a safe and effective option for decompression of orbital masses associated with GPA that have been refractory to medical treatment.

## POSTERS

Poster #108

**Symptom-free days in patients with CRSwNP treated with dupilumab**

Claire Hopkins, Professor of Rhinology  
 Claus Bachert, MD, PhD  
 Joseph Han, MD, FARS  
 Wytske J. Fokkens, Dr.  
 Asif H. Khan, Dr.  
 Jérôme Msihid  
 Scott Nash  
 Shahid Siddiqui  
 Paul J. Rowe  
 Yamo Deniz  
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 Ghent University  
 Ghent, Belgium

**Introduction:**

Dupilumab improved patient-reported daily symptom severity scores in patients with severe chronic rhinosinusitis with nasal polyps (CRSwNP), and was well tolerated, in the SINUS-24/SINUS-52 (NCT02912468/NCT02898454) studies. Objective: To assess post hoc the proportions of patients reporting only symptom-free days (SFD) with dupilumab vs placebo treatment in SINUS-24/52.

**Methods:**

Patients received dupilumab 300 mg every 2 weeks or placebo to W24 (pooled) and W52 (SINUS-52). Patients daily recorded symptom severity for nasal congestion, loss of smell, and anterior and posterior rhinorrhea on a scale of 0–3 (0=no symptoms; 3=severe). Proportions of patients with only SFD (score=0 in the 28-day period before randomization, W24, and W52) were compared for dupilumab and placebo. Patients with data for <21 days in each 28-day period were excluded. SFD were also assessed in patients with prior systemic corticosteroid (SCS) use. All P-values are nominal.

**Results:**

A total of 723 patients (dupilumab n=437; placebo n=286) were included. At baseline, few patients had only SFD in any of the four symptoms (0–3.3%). At W24, 35.4% of dupilumab patients reported only SFD for at least one symptom vs 10.8% with placebo; odds ratio (OR; 95% confidence interval) 4.9 (3.1, 7.8); P<0.0001. This difference increased at W52: 50.0% vs 9.2%; OR 9.1 (4.6, 17.9); P<0.0001. In the prior SCS use subgroup, the proportions reporting only SFD at W24 were 36.3% vs 10.9%; OR 5.3 (3.1, 9.1); P<0.0001, and this difference increased at W52: 50.5% vs 8.3%; OR 10.0 (4.6, 21.7); P<0.0001.

**Conclusion:**

Greater proportions of dupilumab- vs placebo-treated patients with CRSwNP reported only SFD for at least one symptom at W24, with additional improvement at W52.

Poster #109

**Systematic review of endoscopic management of sinonasal adenoid cystic carcinoma**

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 Indiana University School of Medicine  
 Steven Chen, Medical Student  
 Kayla Powell, Medical Student  
 Elisa Illing, MD, FARS  
 Jonathan Ting, MD, FARS  
 Satyan Sreenath, MD

**Background:**

Sinonasal adenoid cystic carcinoma (SNACC) represents a rare but aggressive malignancy with propensity for recurrence. The historical treatment paradigm for SNACC involved open craniofacial approaches with high morbidity. Advances in endoscopic endonasal surgery have shown promising results in SNACC management, however consensus and collective data are limited on the outcomes and clinical features. This systematic review examines the role of the endoscopic endonasal approach for SNACC.

**Methods:**

Following PRISMA, PubMed, Scopus, and Web of Science were searched for articles reporting patient outcomes and oncologic data following endoscopic endonasal management of SNACC. Original articles reporting cases of endoscopically treated SNACC were included with exclusion of open approaches. Demographics, pathology, outcomes, and survival statistics were recorded.

**Results:**

Of 33 studies found, 5 reported specific outcomes and oncologic data for endoscopically treated SNACC, comprising a total of 70 patients. Mean age was 55.2 years. The most common T stage was T4 (61.4%). The most common primary subsite was the ethmoid sinus (37.1%). 54.2% of tumors were intermediate to high grade. Margin-negative resection was achieved in 52.9% of cases. 79.7% of patients received adjuvant radiation. 5-year overall and disease-free survival were 78.1% and 66.8%, respectively. Mean follow-up was 4.37 years with no major complications reported.

**Conclusions:**

Endoscopic management of SNACC followed by radiotherapy yields treatment outcomes comparable to historical reports with less associated morbidity. Further investigation should be geared towards better defining the role of the endoscopic approach for SNACC to guide oncologic treatment.



## POSTERS

## Poster #110

**The CRS mention the top ten most costly physical health condition with a prevalence of 11%**

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## Introduction:

CRS is one of the complications of DNS, and CRS is responsible for a significant disease burden worldwide, with a prevalence of 11%.

## Methods:

A comparative study of fifty-two cases in the Comilla medical college, and Comilla medical center, Bangladesh. Group one 30 surgery was FESS+SMR, two 22 FESS.

## Results:

Prevalence of the coincidence of CRS and DNS was .05%. Group one Visual analog scale (VAS) mean score before and after surgery was 6.40 and .17, group two was 5.27 and 5.00. Independent Samples t-test no significant statistical difference of VAS mean score after surgery between male and female but quite P-values between two groups that Two-Sided  $P=.788>.116>.05$ . Paired Sample t-test showed VAS score before and after surgery was extraordinarily strong significant Two-Sided  $P=<.001<.05$ , and group two had weakly significant 2-sided  $P=.011<.05$ . The Chi-Square test revealed statistically significant differences between residential status and socioeconomic condition in both groups. Still, fewer P-values in group two than group one Two-Sided  $P=.030<.045<.05$ . Pearson, correlation coefficient test, explored well-built relation between VAS score before and after surgery between two groups Two-Sided  $P=<.001<.05$ . Univariate analysis or Two-way between-group ANOVA in group one revealed an effective relationship of VAS score after surgery among sex, symptoms, and sex\*symptoms sex:  $F=23.852$ ,  $P=<.001<.05$ , symptoms:  $F=32.552$ ,  $P=<.001<.05$ , and sex\*symptoms:  $F=10.565$ ,  $P=<.001<.05$  whereas group two exhibit weak relationship sex:  $f=14.027$ ,  $P=.002<.05$ , sex\*symptom:  $F=8.855$ ,  $P=.002<.05$  but symptoms manifested dominant relations  $F=17.107<.05$ .

## Conclusion:

Our comparison displayed that CRS with DNS patients' needs double surgery at a time.

## Poster #111

**The incidence of revision functional endoscopic sinus surgery in Pott's Puffy Tumor**

Samantha Newman  
Tylor Kue Lee, BS  
Stilianos Kountakis, MD, PhD, FARS  
Camilo Reyes, MD, FARS

## Background:

Pott's Puffy Tumor is an uncommon complication of frontal sinusitis with associated subperiosteal abscess and osteomyelitis of the frontal bone. Surgical management is required to drain and open the sinus cavity. Here, we discuss the differences in need for revision surgery between patients with Pott's puffy tumor and those with frontal sinusitis of an alternative etiology.

## Methods:

In this retrospective chart review, 164 patients with exclusively frontal sinusitis were identified from 1998 to 2021. These patients were categorized into those who have been diagnosed with vs. without Pott's Puffy Tumor. The number of revision surgeries and subspecialty consults were measured.

## Results:

Fourteen patients with Pott's Puffy Tumor (8.5%) had a mean for revision surgeries of  $1.36 \pm 1.082$ . Among these 14 patients, 10 underwent revision surgery, one of whom developed a postoperative complication. Patients without Pott's Puffy Tumor ( $n=150$ , 91.5%) had a mean for revision surgeries of  $.2 \pm .463$ . Of these, 26 underwent revision surgery with no complication. There was a significant positive correlation of increased need for revision surgeries in patients with Pott's Puffy Tumor ( $p < .001$ ).

## Conclusion:

Patients with Pott's Puffy Tumor have a significantly higher incidence of revision surgery and post-operative specialist consults. Due to the nature of this disease, a wider frontal sinusotomy like Draf-III should be considered a standard of care with close follow-up to avoid re-intervention.

## POSTERS

Poster #112

**The modification of the flow in the Nose and the Paranasal Sinuses (PNS) before and after FESS-docum**

Jochen Schachenreiter, MD  
 Walter Koch, Prof.  
 Gerhard Ranner, Dr.  
 Robert Jakse, Dr.

CFD (Computational Fluid Dynamics) Simulations require a sophisticated data preparation process beforehand. The workflow of this process starts with the acquisition of CT-Images (DICOM formatted) and finishes with the generation of a 3D-model of nasal cavities and the volume mesh as basic requirement of a CFD-Simulation. This preparatory process is perfectly supported by the Web-Service developed in the context of the Rhinodiagnost.eu project. 3D models are generated in minutes using a CNN (Convolutional Neural Network). Using this new tool, the anatomic structures of the nose and the PNS including all their Ostia can be inspected by especially ENT surgeons.

In a clinical project a typical FESS (Functional Endoscopic Sinus Surgery) defined by Messerklinger/ Stammberger was performed. Before and after surgery we did CT-Scans of the nasal cavities delivering 3D models which show the results of different stages of the surgery. Based on these 3D models delivered by the Rhinodiagnost Segmentation Service, ENT surgeons are able to study the anatomic structures of the paranasal sinuses in a new quality. The preparation of a FESS can be done very specific and gives the ENT surgeons the chance for better performing a FESS not only in the Ostia of Sinus maxillaris and frontalis but also in the smaller Ostia.

We believe that the objectives of FESS might be better achieved also preserving a physiological flow in the nose and their paranasal sinuses postoperatively. Additionally should be discussed if we have to perform surgery in which kind of lower or aggressive form FESS should be done in future. Because the modification of the flow in the nose especially for the paranasal sinuses is essentially.

Poster #113

**The prevalence, duration, and outcome of anosmia in COVID-19 patients**

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 Osama Marglani, Dr.

**Objectives:**

To investigate anosmia in patients with COVID-19 in tertiary care hospitals in two major cities in the Kingdom of Saudi Arabia to determine its prevalence, clinical characteristics, duration and outcome.

**Methods:**

We conducted a retrospective study of 545 COVID-19 patients admitted with a confirmed diagnosis of COVID-19 between May and December, 2020.

**Results:**

Of the 545 patients interviewed, 277 (50.8%) answered all items on the questionnaire. Of those 277, 162 (58.5%) had anosmia. Anosmia was further classified as transient or persistent; the prevalence rates were 94.6% for transient and 5.4% for persistent. Transient anosmia ranged from 2 to 90 days with an average of 14 days. A total of 148 (53.4%) of the 277 patients also experienced dysgeusia.

For 15 patients (5.5%), anosmia was the only symptom; for 11 (3.9%) dysgeusia was the only symptom; 76 (27.1%) of the 162 patients who experienced anosmia reported a subjective impact on quality of life.

**Conclusion:**

More than half of the COVID-19 patients in the study presented with anosmia that was transient in the majority of cases.

Further studies in our region on a larger scale and more focused on comorbidities will be needed to determine the prevalence of anosmia.

Future studies to address the optimal management for this condition will be warranted.

## POSTERS

Poster #114

**Toxic shock syndrome after sinonasal surgery: A systematic review**

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 Stony Brook Medicine  
 Jillian O'Shaughnessy, Miss  
 Jerlon Chiu, Dr.  
 Jessica Koos, Mrs.  
 Sonya Marcus, MD

**Background:**

Toxic Shock Syndrome (TSS) is a commonly cited reason for postoperative antibiotic use when intranasal packing is placed. Our objective was to describe the clinical course and characteristics of those who develop TSS after sinonasal surgery to better understand this rare but serious complication.

**Methods:**

Original research studies were extracted from Medline, Embase, CINAHL, Web of Science, and Cochrane Library databases in accordance with guidelines established by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Patients who developed TSS after sinonasal surgery were included, patients who underwent rhinoplasty and skull base surgery were excluded.

**Results:**

892 studies were identified, 23 studies were included, and 30 cases were analyzed. Mean age was 27.6 years (23.1-32.0, 95% CI). Nineteen (63%) were male. Six (20%) had septoplasty, fourteen (47%) had functional endoscopic sinus surgery (FESS) and ten (33%) had both. Twenty-two (73%) had packing or stents placed, while seven (23%) had neither. Of those with nasal packing: 4 (20%) were absorbable, 13 (65%) were nonabsorbable, and 3 (15%) were not specified. Twelve (40%) received postoperative antibiotics upon discharge. Fever (96.4%), rash (96.4%), hypotension (92.9%), and desquamation (71.4%) were commonly reported symptoms. Twenty-one (70%) required ICU care. One patient died and two suffered long term sequelae.

**Conclusion:**

TSS is a rare complication of sinonasal surgery. Otolaryngologists should be alert to its presentation and clinical course.

Poster #115

**Transnasal endoscopic transpalatal advancement for the treatment of OSA**

Kevin McLaughlin, MD  
 Tracy Vanderwater  
 LSU Health Sciences Center-New Orleans

**Introduction:**

Transpalatal advancement is a well described technique for successfully augmenting the retropalatal airway in CPAP intolerant OSA patients. It is not a widely performed surgery secondary to its technical difficulty and relatively high incidence of complications (25%) and in particular oral nasal fistula (10%). We investigated a novel transnasal endoscopic technique to ascertain if it was ergonomically feasible, relatively easy to perform and able to avoid oral and nasal mucosal incisions so as to reduce the risk for oral nasal fistula.

**Methods:**

Eight cadaver heads were utilized. Various intranasal incisions were performed enabling submucosal endoscopic access to the posterior hard palate. Both endoscopic drill and ultrasonic aspiration successfully removed the necessary portion of the hard palate. Varying suture techniques were utilized to advance the osteotomized keel of bone and attached soft palate.

**Results:**

The varying techniques were videodocumented. Intranasal measurements confirmed excellent anterior advancement of the posterior hard palate and attached soft palate with concomitant enlargement of the retropalatal airway.

**Conclusions:**

Transpalatal advancement can be successfully accomplished through a novel transnasal endoscopic approach without transgressing oral mucosa. Pending institutional review, this technique may offer a safer alternative for transpalatal advancement in CPAP intolerant OSA patients.

## POSTERS

Poster #116

**Transsphenoidal? The tumor is already filling the sphenoid!**

Jordan Teitelbaum, DO  
 ENT Specialists of Illinois  
 Molly Baker  
 Joshua Billingsley

**Background:**

Ectopic pituitary tumor presenting with sphenoid sinus involvement is an unusual sequela of intracranial pathology. Here, we present one challenging multidisciplinary skull base case of a prolactin-secreting pituitary macroadenoma extending to fill the entire sphenoid sinus.

**Case Report:**

A complex intracranial mass was identified in a 22-year-old male who presented to the emergency department with intractable headaches and emesis. Serial imaging demonstrated an enlarging 3.8 x 3.6 x 3.2 cm macrolobulated enhancing sellar lesion with suprasellar extension and severe effacement of the optic chiasm, as well as inferior extension into the sphenoid sinus. Prolactin level was noted to be elevated and patient was originally started on medical therapy but levels doubled and he developed visual symptoms and tumor growth including occupation of the entire sphenoid cavity. The patient was thus taken for endonasal endoscopic approach to sellar tumor with neurorhinology and neurosurgical teams, with gross total resection achieved.

**Discussion:**

Considering the extent of tumor filling the sphenoid sinus, a thorough review was performed to study the current and available literature on ectopic pituitary tumor as it relates to sinus involvement. Management strategies, pathologic variety, surgical technique, and outcomes were examined.

**Conclusions:**

Giant secreting pituitary adenomas are rare. We present a case of prolactinoma with significant suprasellar extension affecting the optic apparatus as well as complete opacification of the sphenoid sinus. We also examined the literature on ectopic pituitary tumors to enhance our understanding of how to manage this difficult and uncommon pathologic presentation.

Poster #117

**Trends in clinical trials for olfactory dysfunction in COVID-19**

Vickie Wang  
 Amar Sheth  
 Hisham Abdou  
 R. Peter Manes, MD, FARS  
 Ryan Rimmer, MD  
 Yale School of Medicine

Olfactory dysfunction (OD) is reported to have a prevalence of up to 85% in acute COVID-19 infection and is a powerful predictor of infection; moreover, it is a highly distressing long-term sequela of COVID-19 infection. This study is the first to characterize clinical trials investigating OD in COVID-19. Using the database ClinicalTrials.gov, 65 trials related to COVID-19-associated OD were found with primary search terms “anosmia” and “olfaction”, and additional keywords “COVID”, “COVID19”, “coronavirus”, and “SARS”. This represents 0.9% of all trials related to COVID-19. Thirty-nine trials (60.0%) were interventional, of which 22 (56.4%) were non-blinded. Four trials (6.2%) had early termination and 26 (40.0%) reached completion. Fourteen trials (21.5%) were conducted in the United States. Forty-eight trials (73.8%) were led by physicians, of which 32 (66.7%) were otolaryngologists. Seventeen studies (26.1%) investigated persistent olfactory dysfunction lasting one month or longer. Three out of 65 studies (4.6%) received federal funding and 3 (4.6%) were funded by industry. Our results show that OD trials have low rates of federal and industry funding, despite the clinical significance of OD as a symptom and chronic sequela of COVID-19 infection. Otolaryngologists appear to be major drivers of COVID-19-related OD clinical trials globally. Fewer than half of the clinical trials in this analysis were blinded, offering areas for future improvement in COVID-19-related OD clinical trials. One limitation of our study is that it includes only trials registered on ClinicalTrials.gov. Future studies should investigate the rate of publication of COVID-19-related OD clinical trials.

## POSTERS

Poster #118

**Twitter trends for sinusitis**

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 Lydia Weykamp  
 Andrew Strumpf  
 William Swift  
 Spencer Payne, MD, FARS  
 Jose Mattos, MD, MPH

**Introduction:**

Twitter is a social media platform used for knowledge sharing and communication. Sinusitis is a highly prevalent disease that is well represented on Twitter. However, no prior reports investigate social media activity around this disease. We 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 containing the keyword 'sinusitis' from March 2012 to May 2020 were examined. Twitter accounts were categorized into general public accounts (GPA) versus healthcare accounts (HA). We analyzed total and yearly tweet metrics, activity, users, words, hashtags, retweets, terms, sentiment, and links.

**Results:**

314,637 relevant tweets were posted by 190,085 users. GPA activity showed increased engagement with others, and fewer original tweets. These conversations centered on symptoms, and treatment topics were more focused on homeopathy. HA engaged less with other users, and posted more original content, practice promotion, links and media. In contrast with GPA, HA promoted traditional treatments like #antibiotics, #balloonsinuplasty, in addition to homeopathy. Links from scientific societies or journals had the lowest representation, while information not backed by medical evidence was highly prevalent. GPA tweets were more frequent in the winter, whereas HA accounts remained consistent year-round. Overall, GPA and HA tweets had a positive sentiment surrounding sinusitis and sinus procedures.

**Conclusion:**

Twitter provides an in-depth understanding of the patterns of conversations held about sinusitis on social media. This provides avenues to improve the communication between patients and providers.

Poster #119

**Unilateral pediatric chronic rhinosinusitis**

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 Mihir Karande  
 Kent Lam, MD, FARS  
 Joseph Han, MD, FARS  
 Eastern Virginia Medical School

**Background:**

Chronic rhinosinusitis (CRS) is commonly a bilateral affliction. In adults, unilateral CRS can be present in up to 23% of cases. Data regarding unilateral sinusitis in pediatric patients with symptoms of chronic rhinosinusitis are limited.

**Methods:**

Patients 18 years or younger who have been diagnosed and treated for CRS at the Children's Hospital of The King's Daughters between 1/1/1999 and 7/5/2020 were included for evaluation. Demographics, diagnoses, clinical presentations, imaging, medications, laboratory findings, and complications were collected to characterize patients with both unilateral and bilateral sinus disease.

**Results:**

A total of 228 patient charts were identified. CT scans were performed in 71% (162) of patients of which 28% (46) were found to have unilateral sinus disease. Of those patients, 34% (16) had nasal polyposis. Patients with bilateral sinus disease had a higher rate of asthma at 47% compared to the 22% in patients with unilateral sinus disease ( $p < 0.05$ ). Patients with unilateral sinusitis had a higher rate of allergic fungal rhinosinusitis at 21% compared to the 6% in patients with bilateral disease ( $p = 0.003$ ). Adenoidectomy was performed more commonly in patients with bilateral disease than in patients with unilateral disease (57% vs 30%,  $p = 0.001$ ) whereas there was no statistically significant difference in rate of endoscopic sinus surgery.

**Conclusion:**

Unilateral CRS can manifest with nasal polyposis in up to 1/3 of pediatric patients who undergo imaging for CRS-related complaints. Patients with bilateral sinusitis are more likely to undergo an adenoidectomy.



## POSTERS

## Poster #120

**Urinalysis dipsticks for differentiating patients with diverse sinus complaints**

Michela Borrelli, BA  
 Arthur Wu, MD, FARS  
 Sarah Ustrell, BS  
 Dennis Tang, MD  
 Martin Hopp, MD, PhD  
 Cedars Sinai

## Background:

A variety of clinical diagnoses present themselves to ENT clinics with “sinus” symptoms including allergic rhinitis, URI, acute and chronic rhinosinusitis, and primary headache. Ultimately, the diagnoses are made based on history and physical exam, but often costly diagnostic tests such as nasal endoscopy and computed tomography are also employed. This study’s objective was to determine if a cheap, commonly available urine dipstick could offer any additional information that would help clinicians differentiate these varying “sinus” diagnoses.

## Methods:

Patients presenting with “sinus” complaints were prospectively enrolled in this IRB approved study to a goal of 100 patients total. Nasal mucus was sampled using a nasal culture swab and used to assess for leukocytes, nitrites, protein, and pH on a urinalysis dipstick. Lund-Kennedy nasal endoscopy scores were recorded as were Lund-McKay CT scores when available. Ultimate diagnoses after all standard testing was recorded. Student’s t-test was used for statistical analysis.

## Results:

Comparing a combined score that integrated all urinalysis variables among 32 patients we found sinusitis patients scored  $8.0 \pm 2.6$  vs  $6.4 \pm 2.8$  for non-sinusitis patients ( $p$  value = 0.09). The study is ongoing and enrollment of a full 100 patients is planned.

## Conclusion:

While a good history is probably the best tool for differentiating various sinonasal complaints, clinicians will often employ costly diagnostic tests to confirm or to convince patients of their ultimate diagnosis. Cost-effective tools that might enhance our ability to make these diagnoses are sorely needed. This study analyzed the ability for common urinalysis dipsticks to aid in clinical diagnosis of sinus complaints.

## Poster #121

**Zygomatic implant salvage and treatment of implant-related CRS with medial maxillectomy**

Gajaan Sittambalam, MS  
 Vidit Talati, MD  
 Sarah Khalife, MD  
 Peter Filip, MD  
 Pete Batra, MD  
 Peter Papagiannopoulos, MD  
 Bobby Tajudeen, MD, FARS

## Background:

Zygomatic implants are used for edentulous maxillae with deficient alveolar bone. When the maxillary sinus mucosa is violated, a foreign body reaction can lead to chronic rhinosinusitis (CRS). Traditionally, implant-related CRS refractory to medical and conservative surgical management necessitated implant removal. However, modified endoscopic medial maxillectomy (MEMM) is a novel and effective procedure that may allow for zygomatic implant salvage.

## Methods:

The clinical course of three patients with refractory CRS due to zygomatic implantation who underwent MEMM are described. Pre-operative clinical presentations, imaging, office endoscopies, surgical findings and techniques, and post-operative clinical and endoscopic outcomes were retrospectively reviewed.

## Results:

All patients presented with congestion, discharge, facial pain/pressure, and/or hyposmia after failing antibiotic therapy. Two patients underwent antral lavage with recurrence prior to referral. Pre-operative computed tomography (CT) showed implant penetration into the sinus with partial or complete opacification. Post-operative management included debridements, antibiotic/steroid irrigations, oral antibiotics, and/or oral steroids. Pre-operative SNOT-22 scores were 25, 25, and 46 compared to 6, 13, and 15 after 2, 7, and 15 months of follow-up, respectively. Post-operative courses were also characterized by resolution of sinus opacification, healthy-appearing mucosa, minimal edema or drainage, no CRS recurrence, and implant preservation.

## Conclusion:

This case series shows that MEMM may be an efficacious procedure to address refractory CRS caused by zygomatic implantation. MEMM with meticulous post-operative care can allow for zygomatic implant salvage.

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