American Rhinologic Society

# COSM 2024

## May 15-16, 2024

**Hyatt Regency Chicago**
**Chicago, IL**

# PROGRAM GUIDE

Pete Batra, MD, FACS, FARS

# Presidential Welcome
## to the ARS at COSM 2024

We are excited to gather in Chicago for the 2024 American Rhinologic Society meeting at COSM!

Each year, the Spring COSM meeting brings us together to learn about the latest groundbreaking research and to engage in discussion on salient topics in rhinology from the leading experts in the field. President-Elect and Program Chair Kevin Welch has developed an exceptional educational program for this meeting. The program will provide a blend of outstanding research presentations, debates, panels, and targeted conversations covering wide array of sinonasal, skull base, and allergic disorders. Wednesday evening will end with the ARS President's reception and offer a wonderful opportunity to network with colleagues from across the country. Thursday evening will host a joint ARS and AHNS reception to commemorate the recently published International Consensus Statement on Sinonasal Tumors and further strengthen collaboration amongst colleagues in rhinology and head and neck surgery.

The ARS continues to thrive and accomplish amazing things. We stand at the forefront of advancing excellence in the field of rhinology shaping the future of patient care through research, education, and innovation in the US and abroad. We continue to partner with sister rhinologic societies around the world, increasing cooperation on research and education globally. This is a credit to the energy and enthusiasm of the dedicated membership through their work in the committees, sections, and society. It is truly a privilege to be part of this amazing organization.

I am thrilled to welcome you to the Windy City, known for its captivating skyline, rich culture, and renowned culinary scene. From iconic landmarks like Cloud Gate in Millennium Park and Magnificent Mile to the hidden gems nestled across its diverse neighborhoods, the city offers an unforgettable backdrop to the meeting. I hope you will maximize your time in Chicago and take advantage of the innumerable leisurely activities outside of the terrific educational and networking opportunities during this ARS meeting. I look forward to connecting with you. As always, thank you for your engagement and continued support of the ARS!

Pete S. Batra, MD, FACS, FARS
President,
American Rhinologic Society

# ARS Spring Meeting at COSM - Welcome to Chicago!
## from the President-Elect & Program Chair


Kevin Welch, MD, FACS, FARS

On behalf of the Program Committee and the American Rhinologic Society, I welcome you to the city of Chicago, which is hosting the 2024 COSM meeting. The ARS Meeting at COSM is a two day experience that highlights the incredibly hard work and scientific exploration that is being performed by our talented and growing membership. Over these two days, participants will tune into the latest research discoveries and into lively discussions covering areas of debate. Join us at the Hyatt Regency in Chicago, right on the riverfront, May 15-16, 2024.

I'm thrilled to announce that the Program Committee received and reviewed 254 abstract submissions – the highest ever! As a result, we've expanded our footprint for this meeting to present 82 oral scientific presentations and 172 poster presentations. Each member of the Abstract Review Committee scrutinized each abstract and diligently graded them to ensure the highest quality scientific content.

We start Wednesday, May 15, 2024, with a joint session. As in the past, we will have authors present the top 5 clinical and the top 5 basic science abstracts. Adjoining these presentations will be two informative panels. Plan to explore the important question of whether biologic therapy is better deployed after partial sinus surgery or complete sinus surgery. The effects of particulate matter on the upper and lower airways is of growing concern, and members of the Allergy Section will explore this in a multidisciplinary panel. Our afternoon on May 15 will feature two breakout rooms that explore the topics of CRS mechanisms, endotypes, medical and surgical treatments of CRS, skull base surgery, and social determinants of health. Plan to engage with panels who will discuss DEI initiatives, medical and surgical treatments of recurrent acute rhinosinusitis, de-escalation of medical therapy, and measuring success in skull base surgery. I am grateful to all the ARS members of are offering their expertise as well as to several physicians in pulmonary medicine, allergy & immunology, endocrinology, and neurosurgery who are offering different perspectives on diseases we treat.

Join us for the President's Reception, which begins at 5:30 PM.

On Thursday, May 16, 2024, our afternoon will be filled by scientific presentations in two breakout rooms, and topics will explore pediatrics, cystic fibrosis, artificial intelligence, drug investigation, skull base surgery, empty nose syndrome, olfaction, and rhinitis. We'll hear debates and discussions about managing the nasal valve, alternative therapies for olfaction and management of Draf III procedures. We're also very proud to announce a joint panel with members of the ARS and the AHNS who will highlight and discuss ICAR Tumors. A reception to celebrate the submission will follow.

There's something for everyone at the 2024 ARS at COSM meeting, and we thank you for your continued and ongoing support of our organization.

## ARS at COSM 2024 Program Committee

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*Program Chair*

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# American Rhinologic Society Executives - 2024

**Pete Batra, MD, FARS**
President
Rush University Medical Center
1611 W. Harrison Street, Suite 550
Chicago, IL 60612
Tel: 312-942-7182
Fax: 312-942-6653
Email: pete_batra@rush.edu

**Kevin Welch, MD, FARS**
President-Elect
Northwestern University
675 N. St Clair Street
Suite 15-200
Chicago, IL 60611
Tel: 312-695-3115
Email: kcwelchmd@gmail.com

**R. Peter Manes, MD, FARS**
Secretary
Yale School of Medicine
800 Howard Avenue, 4th Floor
New Haven, CT 06519
Tel: 203-785-5430
Email: rpeter.manes@yale.edu

**Jivianne Lee, MD, FARS**
Treasurer
UCLA Medical Center
1131 Wilshire Boulevard
Santa Monica, CA 90401
Tel: 424-259-6559
Email: jtlee@mednet.ucla.edu

**Amber Luong, MD, PhD, FARS**
First Vice President
McGovern Medical School at the University of Texas Health Science Center
6431 Fannin Street
MSB 5.036
Houston, TX 77030
Tel: 713-500-5421
Email: amber.u.luong@uth.tmc.edu

**Marc Dubin, MD, FARS**
Centers for Advanced ENT Care – ENT Associates at GBMC
6565 N. Charles Street, Suite 601
Baltimore, MD 21204
Tel: 410-821-5151
Email: mdubin@cadentcare.com

**Sarah Wise, MD, FARS**
Past President
Emory University
550 Peachtree Street
MOT 11th Floor
Atlanta, GA 30308
Tel: 404-778-3381
Fax: 404-686-4540
Email: skmille@emory.edu

**Michael Stewart, MD, FARS**
Executive Vice President
Weill Cornell Medical College
575 Lexington Avenue
New York, NY 10022
Tel: 646-962-4777
Fax: 646-962-0388
Email: mgs2002@med.cornell.edu

**Brent Senior, MD, FARS**
VP Development & Strategic Initiatives
UNC School of Medicine
Physician's Office Building, G-190
170 Manning Drive, CB#7070
Chapel Hill, NC 27599
Tel: 919-966-3344
Fax: 919-966-7941
Email: Brent_Senior@med.unc.edu

**Wendi Perez**
Executive Administrator
P.O. Box 269
Oak Ridge, NJ 07438
Phone: 973-545-2735
Fax: 973-545-2736 x6
Email: wendi@american-rhinologic.org

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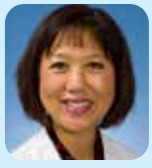
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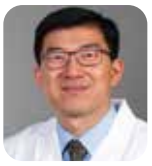

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# ARS Mission Statement

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**
ARS designates this live activity for a maximum of 10.50 AMA PRA Category 1 Credit(s)™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

# Learning Objectives from Practice Gaps

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

- Discuss the current evidence-based recommendations for the treatment of disorders that affect the nose and the sinuses such as chronic rhinosinusitis, allergic rhinitis, nasal airway obstruction, smell loss, and benign and malignant tumors.
- Discuss the medical and surgical management of recurrent acute and chronic rhinosinusitis through research presentations, debates, and panel discussions.
- Improve the understanding of our members that social determinants of health are important variables that affect our patients' access to care and their outcomes and that these disparities affect not limited medical practitioners but all practitioners caring for patients of diverse backgrounds and means.
- Explore alternative therapies to COVID-19-related and other causes of smell loss, including stellate ganglion infection, alternative medicines, and olfactory retraining
- Assess and explore how we evaluate successful outcomes in skull base surgery through the interaction of rhinologists, endocrinologists, and neurosurgeons.
- Understand and appreciate that matters of diversity, equity, and inclusion are critical to facilitating collaborative partnerships among practitioners

# How to Obtain Your CME Certificate

At the conclusion of the meeting, you will be provided with a post-meeting link to claim your CME.

# The IFAR Top 20 Reviewers

Edward Kuan, MD, FARS
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Naweed Chowdhury, MD
Nicholas Rowan, MD
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Namita Kansal, MD
Jessica Southwood, MD

*As of 5/2/24*

# ARS at COSM 2024 Scientific Abstract Reviewers

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Do-Yeon Cho, MD
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Kevin Welch, MD, FARS
Carol Yan, MD
William Yao, MD, FARS

# *PROGRAM AT-A-GLANCE*

## MEETING HIGHLIGHTS

- 2 days, 2-afternoon breakout sessions
- 82 oral scientific presentations
- 175 poster presentations
- Exciting and informative panels covering particulate matter and the effects on upper and lower airways, skull base surgery outcomes, biologics v. surgery, the management of the nasal valve, and establishing diversity programs.
- Women in Rhinology Breakfast Session
- Combined ARS and AHNS Panel
- Multidisciplinary participation involving Rhinology, Allergy & Immunology, Neurosurgery, Pulmonary and Critical Care, and Endocrinology
- High-impact discussions and debates covering surgical v. medical management of recurrent acute rhinosinusitis, mucosal coverage following Draf III surgeries, de-escalation of medical therapy, and alternative therapies for smell loss
- Maximum of 10.5 AMA PRA Category 1 Credit(s)™

## Wednesday, May 15, 2024
## Morning Session
## Grand Ballroom CD
## 8:00 am – 12:00 pm CST

7:00 am – 8:00 am
**Women in Rhinology Session**
Guest Speaker: Dana M. Thompson, MD, MS, MBA, FACS
"Allyship in the pathway beyond the 'glass ceiling'"

8:00 am – 8:05 am
**Welcome**
Pete Batra, MD, FARS; Kevin Welch, MD, FARS

### Oral Presentations: Top Basic Science

*Moderators: Benjamin Bleier, MD, FARS; Stella Lee, MD; Elina Toskala*, MD, FARS

8:05 am – 8:13 am
**Calcitriol restores olfactory impairment in mice with smoke induced sinusitis**
Jennifer Mulligan, PhD

8:14 am – 8:22 am
**In-clinic eosinophil peroxidase level as a diagnostic test of eosinophilic CRS**
Jacquelyn Callander, MD

8:23 am – 8:31 am
**D-2-hydroxyglutarate supresses IgE production in murine allergic rhinitis**
Anuj Tharakan, PhD

8:32 am – 8:40 am
**Complement activation correlates with impaired olfactory function in CRSwNP**
Sufiya Ali, BA

8:41 am – 8:49 am
**The role of MMP-11 in inverted papilloma migration and transformation**
Kush Panara, MD

8:50 am – 8:55 am
**Q&A**

8:56 am – 9:05 am
**Awards Ceremony**
Jean Kim, MD, FARS

9:05 am – 9:45 am
**PANEL: Targeted ESS plus Biologics vs. Complete ESS and Local Therapies – False Choice or Our Future?**
Moderator: James Palmer, MD, FARS
Panelists: David Gudis, MD, FARS; Douglas Reh, MD, FARS; Sarah Wise, MD, FARS

9:45 am – 10:15 am
**Break with Exhibitors**

## Oral Presentations: Top Clinical Abstracts

*Moderators: Adam DeConde, MD; Angela Donaldson, MD, FARS; Ashleigh Halderman, MD, FARS*

10:15 am – 10:23 am
**Long term air pollution and genetic predisposition in chronic rhinosinusitis**
Murugappan Ramanathan, MD, FARS

10:24 am – 10:32 am
**An eosinophil peroxidase activity assay predicts acute exacerbations in post-operative chronic rhinosinusitis**
Conner Massey, MD

10:33 am – 10:41 am
**Characterizing conflicts of interest in biologics literature for CRSwNP**
Christina Liu, MS

10:42 am – 10:50 am
**CRS type 2 biomarkers correlate with baseline SNOT-22 rhinologic domain independent of nasal polyp status**
Nikita Chapurin, MD, MHS

10:51 am – 10:59 am
**Oxymetazoline to predict turbinate reduction surgery outcome: prospective, single-blinded, CFD study**
Zachary Root, BS

11:00 am – 11:05 am
**Q&A**

11:05 am – 11:55 am
**Panel: Air Pollution and Particulate Matter: Implications in Upper and Lower Airway Disease**
Moderator: Regan Bergmark, MD, MPH, FARS
Panelists: G.R. Scott Budinger, MD; Peter Hwang, MD, FARS; Stella Lee, MD; Murugappan Ramanathan, MD, FARS

11:55 am – 12:00 pm
**Q&A**

12:00 pm – 1:00 pm
**Lunch with Exhibitors**

## Wednesday, May 15, 2024
## Afternoon Session
## Grand Ballroom CD
## 1:00 pm – 5:00 pm CST

*Moderators: Michael Kohanski, MD; Kristine Smith, MD*

1:00 pm – 1:06 pm
**Predictors of control in biologic treated eosinophilic chronic rhinosinusitis**
Lu Hui Png, MD

1:07 pm – 1:13 pm
**Need for biologic rescue in CRSwNP following endoscopic modified lothrop procedure**
Keven Ji

1:14 pm – 1:20 pm
**Chitosan-based encapsulation for controlled topical drug release in rhinosinusitis**
Do-Yeon Cho, MD

1:21 pm – 1:27 pm
**FDA-approved biologics for chronic rhinosinusitis with nasal polyps: An analysis of FAERS data**
Radhika Duggal, MA

1:28 pm – 1:34 pm
**Histopathology of recalcitrant maxillary sinusitis requiring endoscopic medial maxillectomy**
Vidit Talati, MD, MS

1:35 pm – 1:41 pm
**Trends in Dupilumab utilization for nasal polyposis**
Daniel Xiao

1:42 pm – 1:48 pm
**Prevalence of primary humoral immunodeficiency based on CRS endotype**
Chioma Anidi, BA

1:49 pm – 1:55 pm
**Q&A**

*Moderators: Charles Ebert, MD, FARS: R. Peter Manes, MD, FARS*

1:56 pm – 2:02 pm
**Examining race and chronic rhinosinusitis' effects on asthma in unified airway diseases**
Evan Patel, MS

2:03 pm – 2:09 pm
**Social factors associated with treatment completion in aspirin exacerbated respiratory disease**
Shravan Asthana, BS

2:10 pm – 2:16 pm
**Frailty is associated with endotypic shifts in cytokine profiles in chronic rhinosinusitis**
Mason Krysinski, MD

2:17 pm – 2:23 pm
**Sniffing out frailty: A prospective case-control study assessing olfactory subdomains and frailty**
Michael Cheng, MD

2:24 pm – 2:30 pm
**Area deprivation index and CRS**
Amarbir Gill, MD

2:31 pm – 2:37 pm
**Assessing the efficacy of shared decision-making in the management of chronic rhinosinusitis**
Vivienne Li, BA

2:38 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeting Discussions and Debates: De-escalation of Therapies in CRS**
Moderator: Vijay Ramakrishnan, MD, FARS
Panelists: Elisa Illing, MD, FARS; Anju Peters, MD

*Moderators: Kibwei McKinney, MD; Charles Tong, MD, FARS*

3:31 pm – 3:37 pm
**University of Washington quality of life subdomain outcomes after treatment in sinonasal malignancy**
Sabrina Maoz, PhD

3:38 pm – 3:44 pm
**Are routine lumbar drains necessary after endoscopic resection of anterior skull base tumors?**
Jacob Harris, BA

3:45 pm – 3:51 pm
**Longer-term surveillance imaging and endoscopy needed in majority of sinonasal malignancy recurrence**
Alan Workman, MD, MTR

3:52 pm – 3:58 pm
**The role of induction chemotherapy for orbital invasion in sinonasal malignancies**
Anthony Tang, BS

3:59 pm – 4:05 pm
**Outcomes of endoscopic endonasal resection for pediatric craniopharyngiomas**
David Lerner, MD

4:05 pm – 4:11 pm
**Q&A**

4:12 pm – 4:55 pm
**Panel: How Do We Measure Success in Endoscopic Skull Base Surgery?**
Moderator: Gurston Nyquist, MD, FARS
Panelists: Odelia Cooper, MD; Ashleigh Halderman, MD, FARS; Stephen Magill, MD; Chirag Patel, MD, FARS

4:55 pm – 5:00 pm
**Q&A**

5:00 pm – 5:30 pm
**ARS Business Meeting**

5:30 pm – 7:00 pm
**ARS President's Reception**
**Plaza Ballroom**

## Wednesday, May 15, 2024
## Afternoon Concurrent Session
## Grand Hall MNL
## 1:00 pm – 5:00 pm CST

*Moderators: Nicholas Rowan, MD; Stephanie Smith, MD*

1:00 pm – 1:06 pm
**Inhalational exposure history is associated with differential sinonasal gene expression profiles**
Cameron Worden, MD

1:07 pm – 1:13 pm
**Arachidonic acid metabolites in nasal mucus distinguish chronic rhinosinusitis from non-sinusitis**
Marisa Griesel

1:14 pm – 1:20 pm
**Particulate matter may increase polyp risk**
Rory Lubner, MD

1:21 pm – 1:27 pm
**Purine metabolism is upregulated in chronic rhinosinusitis: Implications for injury**
Maria Villanueva, BS

1:28 pm – 1:34 pm
**Sinonasal transcriptome study of chronic rhinosinusitis with and without asthma**
Nitish Kumar, MBBS, MS

1:35 pm – 1:41 pm
**Mediation of LPS-induced inflammation with pro-resolving treatment in human nasal polyp tissue**
Vijay Ramakrishnan, MD, FARS

1:42 pm – 1:48 pm
**Machine learning to identify nasal mucus biomarkers associated with olfactory loss in patient**
Jennifer Mulligan, PhD

1:49 pm – 1:55 pm
**Q&A**

*Moderators: Do-Yeon Cho, MD; Devyani Lal, MD, FARS*

1:56 pm – 2:02 pm
**Impact of LYR-220 on ethmoid opacification and CRS symptoms in the BEACON study**
Brent Senior, MD, FARS

2:03 pm – 2:09 pm
**EDS-FLU for CRS: Prior ESS subgroup analysis**
Sarah Wise, MD, FARS

2:10 pm – 2:16 pm
**Topical steroids for CRSsNP: A systematic review and meta-analysis**
Akash Bhat, BS

2:17 pm – 2:23 pm
**A cost utility analysis for the management of acute exacerbations of chronic rhinosinusitis**
Matthew Chu, MD

2:24 pm – 2:30 pm
**Incidence of infections during AECRS in CRS adults**
Nirushan Narendran, MS

2:31 pm – 2:37 pm
**Comparative effectiveness of medical and surgical treatment for recurrent acute rhinosinusitis**
Connor Hunt, BS

2:38 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: RARS Surgery v. Medical Management**
Moderator: Sandra Lin, MD, FARS
Panelists: Chadi Makary, MD, FARS; Jennifer Villwock, MD

*Moderators: Victoria Lee, MD, FARS; Kenneth Rodriguez, MD*

3:31 pm – 3:37 pm
**Linguistic gender differences in rhinology fellowship LORs: A multi-institutional temporal study**
Vikram Vasan, BA

3:38 pm – 3:44 pm
**The impact of cadaveric donor transplant on the development of chronic rhinosinusitis**
Estephania Candelo, MD, MSc

3:45 pm – 3:51 pm
**ETDQ-7 poorly predicts eustachian tube dysfunction in patients with tinnitus**
Najm Khan, MBS

3:52 pm – 3:58 pm
**Effectiveness of hypertonic saline post-endoscopic sinus surgery**
Rodolfo Giffoni

3:59 pm – 4:05 pm
**Spending, utilization, and coverage for CRSwNP therapies among Medicare Advantage beneficiaries**
Akash Bhat, BS

4:05 pm – 4:11 pm
**Q&A**

4:12 pm – 4:55 pm
**Panel: "Challenges in Pediatric Rhinology"**
Moderator: David Gudis, MD, FARS
Panelists: Angela Donaldson, MD, FARS; Amrita Ray, MD, FARS; Chadi Makary, MD, FARS

4:55 pm – 5:00 pm
**Q&A**

5:00 pm – 5:30 pm
**ARS Business Meeting**

5:30 pm – 7:00 pm
**ARS President's Reception**
**Plaza Ballroom**

## Thursday, May 16, 2024
## Afternoon Session
## Grand Ballroom AB
## 1:00 pm – 5:05 pm CST

7:00 am – 12:00 pm
**ARS Board of Directors Meeting**
**Plaza Ballroom**

*Moderators: David Gudis, MD, FARS; Elisa Illing, MD, FARS*

1:00 pm – 1:06 pm
**Autoimmune dysregulation in children with chronic rhinosinusitis**
Sairisheel Gabbireddy, MD

1:07 pm – 1:13 pm
**National pediatric acute invasive fungal sinusitis outcomes over a 13-year period**
Matthew Wu, MD

1:14 pm – 1:20 pm
**Symptom prioritization for the treatment chronic rhinosinusitis in people with cystic fibrosis**
Christine Liu, BS

1:21 pm – 1:27 pm
**Impact of elexacaftor/tezacaftor/ivacaftor on rates of FESS in cystic fibrosis**
Graham Pingree, BA

1:28 pm – 1:32 pm
**Q&A**

*Moderators: Charles Ebert, MD, FARS; Caitlin McLean, MD*

1:33 pm – 1:39 pm
**Machine learning predicts presence of sinonasal inflammation on CT using patient-generated data**
Arun Raghavan, MD

1:40 pm – 1:46 pm
**Multi-institutional validation of an AI-based sinus CT analytic algorithm**
Conner Massey, MD

1:47 pm – 1:53 pm
**3D surgical planning software to improve resident frontal sinusotomy**
Andrew Kelly, MD

1:54 pm – 2:00 pm
**The use of a convolutional neural network to automate radiologic scoring of CT sinuses**
Daniel Lee, MD, FRCSC

2:01 pm – 2:05 pm
**Q&A**

*Moderators: Peter Papagiannopoulos, MD; Bobby Tajudeen, MD, FARS*

2:06 pm – 2:12 pm
**Investigating efficacy and toxicity of topical agents for the treatment of CRS**
Sam Hale, BMedSc(Hons), MBChB

2:13 pm – 2:19 pm
**Orbital decompression for thyroid eye disease: Outcomes by preoperative severity and technique**
Lazaro Peraza, MD

2:20 pm – 2:26 pm
**Post-operative outcomes of benign orbital tumor resection are independent of tumor xize & morphology**
Angela Zhu, BA

2:27 pm – 2:33 pm
**Virtual reality and wearable devices after skull base surgery**
Vivek Pandrangi, MD

2:34 pm – 2:40 pm
**AI-modified and generated patient education materials for skull base surgery**
Michael Warn, BS

2:40 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: Draf III and Other Drill-Outs: The Mucosal Coverage Controversy**
Moderator: Jivianne Lee, MD, FARS
Panelists: Pete Batra, MD, FARS; Jessica Grayson, MD, FARS

*Moderators: Anthony Del Signore, MD, FARS; Mathew Geltzeiler, MD, FARS: Katie Melder, MD*

3:31 pm – 3:37 pm
**Prognostic significance of dysplasia in sinonasal inverted papilloma: A multi-institutional study**
Alexis Kim, BA

3:38 pm – 3:44 pm
**The inflammatory environment of sinonasal inverted papilloma**
Alana Ravasio, BS

3:45 pm – 3:51 pm
**Advancing IP and IP-SCC diagnosis: AutoML vs. traditional deep learning**
Farideh Hosseinzadeh, MD

3:52 pm – 3:58 pm
**Prolonged surveillance in inverted papilloma shows late recurrences and no benefit to frozen section**
Alan Workman, MD, MTR

3:59 pm – 4:05 pm
**Quality-of-life outcomes following endoscopic resection of sinonasal inverted papilloma**
Arash Abiri

4:06 pm – 4:12 pm
**Q&A**

4:13 pm – 5:00 pm
**Combined ARS and AHNS Panel:**
**ICSNT: How It Can Help Your Practice**
Moderator: Edward Kuan, MD, FARS
Panelists: Daniel Beswick, MD, FARS; Nyall London, MD, FARS; James Palmer, MD, FARS; Timothy Smith, MD, FARS; Shirley Su, MD; Eric Wang, MD, FARS; Marilen Wang, MD, FARS

5:00 pm – 5:05 pm
**Q&A**

5:05 pm
**Meeting Adjourns**

5:30 pm – 7:00 pm
**ARS and AHNS Combined Reception**
Michigan Ballroom and Foyer

## Thursday, May 16, 2024
## Afternoon Concurrent Session – Grand Hall MNL
## 1:00 pm – 5:05 pm CST

7:00 am – 12:00 pm
**ARS Board of Directors Meeting**
**Plaza Ballroom**

*Moderators: Jean Kim, MD, FARS; Spencer Payne, MD, FARS*

1:00 pm – 1:06 pm
**Medial flap turbinoplasty is unlikely to cause empty nose syndrome**
Yasser Almansour

1:07 pm – 1:13 pm
**Accuracy of the modified cotton test for ENS**
Lirit Levi, MD

1:14 pm – 1:20 pm
**Subtotal middle turbinate resection is unlikely to cause empty nose syndrome**
Jacob Eide, MD

1:21 pm – 1:27 pm
**Bovine derived collagen matrix in the treatment of empty nose syndrome**
Brian Cameron, MD

1:28 pm – 1:32 pm
**Q&A**

*Moderators: Kara Detwiller, MD, FARS; Jose Gurrola, MD*

1:33 pm – 1:39 pm
**Sniffing out trouble: Unmasking the dangers of VOCs on olfaction**
Margaret B. Mitchell, MD, MS-HPEd

1:40 pm – 1:46 pm
**Evaluating olfactory function and quality of life in patients with traumatic brain injury**
Amelia Lawrence, BS

1:47 pm – 1:53 pm
**Subjective vs. objective olfactory assessment**
Aurelia S. Monk, BA

1:54 pm – 2:00 pm
**Age-related differences in olfactory retraining outcomes: A prospective cohort study**
Amelia Lawrence, BS

2:01 pm – 2:07 pm
**Efficacy of the nasal airflow-inducing maneuver in the olfactory rehabilitation of laryngectomy patients: A systematic review and meta-analysis**
Kurtis Young, MD

2:08 pm – 2:12 pm
**Q&A**

*Moderators: Stella Lee, MD; Amber Luong, MD, PhD, FARS*

2:13 pm – 2:19 pm
**COVID-19 associated dysgeusia and olfactory dysfunction impact on nutrition and quality of life**
Amelia Lawrence, BS

2:20 pm – 2:26 pm
**Paxlovid is associated with lower rates of chronic post-COVID-19 smell and taste disorders**
Esther Wang, BS

2:27 pm – 2:33 pm
**Corticosteroid responsive olfactory dysfunction in CRS: What does it mean?**
Kaete Archer, MD

2:34 pm – 2:40 pm
**Topography of odorant specific recognition: Preliminary investigation into an olfactory map**
Harish Dharmarajan, MD

2:40 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: Alternative Therapies for Smell Loss**
Moderator: Kristine Smith, MD
Panelists: Joshua Levy, MD, FARS; Zara Patel, MD, FARS

*Moderators: Toby Steele, MD; William Yao, MD, FARS*

3:31 pm – 3:37 pm
**Twelve-month outcomes of septal swell body reduction using temperature-controlled radiofrequency**
Jordan Pritikin, MD, FARS

3:38 pm – 3:44 pm
**Posterior nasal nerve surgical neurectomy versus ablation for chronic rhinitis**
Sainiteesh Maddineni

3:45 pm – 3:51 pm
**Nasal obstruction outcomes in chronic topical nasal decongestant use patients**
Anthony Di Ponio, DO

3:52 pm – 3:58 pm
**Mouth breathing correction reduces exercise-induced bronchoconstriction in adults and children**
Yusuf M. Gulleth, MD

3:59 pm – 4:05 pm
**Impact of posture and CPAP therapy on nasal airflow partitioning**
Ahmad Hamdan, Medical Student

4:06 pm – 4:12 pm
**Q&A**

4:13 pm – 5:00 pm
**Panel: The Nasal Valve: Selecting Patients for Minimally Invasive v. Open Procedures**
Moderator: William Yao, MD, FARS
Panelists: Henry Barham, MD, FARS; Monica Patadia, MD; Douglas Sidle, MD; Brent Senior, MD, FARS; David Yen, MD

5:00 pm – 5:05 pm
**Q&A**

5:05 pm
**Meeting Adjourns**

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## ARS Poster Viewing

**Wednesday, May 15, 2023**
**1:00 pm - 7:00 pm**

**Thursday, May 16, 2023**
**9:00 am - 7:00 pm**
**Riverside Exhibit Hall**

**ARS Combined Poster Reception**
**Thursday, May 16, 2024**
**5:30 pm – 7:00 pm**
**Riverside Exhibit Hall**

Poster #C001
**FAERS olfactory adverse events**
Daniel Lofgren, DO

Poster #C002
**24-hour antibiotic prophylaxis regimen is effective in ESBS**
Ashleigh Halderman, MD, FARS

Poster #C003
**30-day readmissions after endoscopic pituitary surgery**
Ashleigh Halderman, MD, FARS

Poster #C004
**A retrospective analysis of office-based rhinologic procedures**
Sarah Zahabi, MD

Poster #C005
**A scoping review of female sex hormones' influence on airway inflammation at the cellular level**
Anthony Dick, MD, MPH

Poster #C006
**A systematic review of patient frailty and endoscopic endonasal skull base surgery outcomes**
Sofia Olsson, BS

Poster #C007
**ADI does not predict CSF leak risk in pituitary adenoma resection**
Tyler Merrill, MD

Poster #C008
**ADI does not predict readmissions after endoscopic skull base surgery**
Jakub Jarmula, BA

Poster #C009
**Adjunctive dupilumab treatment after surgery in CRSwNP**
Yi-Tsen Lin, MD, PhD

Poster #C010
**AERD treatment outcomes improve more rapidly with institutional experience**
Jennifer Douglas, MD

Poster #C011
**AI vs web-based sinus surgery patient education material**
Anu Sharma, BS

Poster #C012
**AI vs. residents: ChatGPT versions in otolaryngology exams**
Evan Patel, MS

Poster #C013
**An analysis of ChatGPT recommendations to current guidelines in adult sinusitis**
Shaun Edalati, BS

Poster #C014
**An analysis of treatment experiences in the prolactinoma subreddit**
Rose Dimitroyannis, BA

Poster #C015
**An unusual case of nasal chondromesenchymal hamartoma**
Stefano Millarelli

Poster #C016
**Anatomical factors addressed during contemporaneous revision sinus surgery for chronic pansinusitis**
Nitish Kumar, MS

Poster #C017
**Ancient history of nasal reconstruction: The origins of beauty and the impact on global surgery**
Jonathan Deck, BS

Poster #C018
**Anosmia by SARS-CoV-2 strain**
Shreya Mandloi, BS

Poster #C019
**Approach to Intracranial Internal carotid artery pseudoaneurysm rupture**
Smile Kajal, MD

Poster #C020
**Area deprivation index scores do not predict delay to Draf III procedures**
Murray Bartho, BS

Poster #C021
**Assessing the efficacy of a customized 3D-printed septal prothesis based on the NOSE-perf score**
Pedro Lanca Gomes, MD

Poster #C022
**Association of prior nose surgery with olfactory function among older adults**
Khamis Suleiman

Poster #C023
**Baseline characteristics of AROMA study CRSwNP patients by number of surgeries**
Jay Pinto, MD

Poster #C024
**Baseline characteristics of CRSwNP patients by surgical history in AROMA study**
Jay Pinto, MD

Poster #C025
**Bimodal neurosensory stimulation by olfactory training with visual stimulation**
Supinda Chusakul, MD

Poster #C026
**Biologic therapy and CRSsNP endoscopic sinus surgery rates**
Kevin Herrera, BS

Poster #C027
**Case of bilateral concurrent sinonasal pleomorphic adenoma and glomangiopericytoma**
Chappel Pettit

Poster #C028
**Characterizing donor susceptibility to EBV infection in the nasopharynx using organotypic rafts**
Shwet Kitchloo

Poster #C029
**ChatGPT antibiotic stewardship**
Nick Melott

Poster #C030
**Chronic granulomatous IFS with intracranial extension causing vision loss**
Kue Lee, BS

Poster #C031
**Chronic rhinosinusitis incidence before and during COVID-19 pandemic: A retrospective cohort study**
Jen Li Dong, BS

Poster #C032
**Comparing estimated and actual blood loss in FESS**
Kevin Fujita-Howie, MD

Poster #C033
**CRS in patients with hematologic malignancies who have undergone organ transplantation**
Karol Avila-Castano, MD

Poster #C034
**CRS onset in solid vs non-solid transplanted population**
Anyull Bohorquez, MD

Poster #C035
**CRSwNP disease burden by subspecialty**
Larry Borish, MD

Poster #C036
**Delayed nasopharyngeal stenosis and clival osteoradionecrosis in patient with chondrosarcoma**
Antonio Bon-Nieves, BS

Poster #C037
**Delayed vision loss s/p resection of tuberculum sellae meningioma by endoscopic endonasal surgery**
Mélyssa Fortin, MD

Poster #C038
**Demographic and research characteristics of United States rhinology fellowship directors**
Mark Mascera, MEng

Poster #C039
**Demographics, clinical features, and follow-up trends of sinus surgery patients**
Ravi Dhamija, BA

Poster #C040
**Detection of plagiarism among rhinology scientific journals**
Ezer Benaim, MD

Poster #C041
**WITHDRAWN**

Poster #C042
**WITHDRAWN**

Poster #C043
**WITHDRAWN**

Poster #C044
**Efficacy of preoperative procedural patient education to mitigate stress and anxiety: A randomized controlled trial**
Ranny Assaf, MD

Poster #C045
**Efficacy of steroid rinses and smell retraining in restoring olfactory function in COVID**
Ethan McGann, MD

Poster #C046
**Emerging imaging techniques for the diagnosis of CRS**
Adwight Risbud, MD

Poster #C047
**Empty nose syndrome: A systematic review of management options**
Salman Hussain MB, BCh, BAO

Poster #C048
**Endoscopic endonasal approach to control of pterygoid plexus hemorrhage following LeFort I osteotomy**
Paul Cowan, DO, MS

Poster #C049
**Enhancing efficiency and reducing costs through instrument consolidation in endoscopic sinus surgery**
Anish Kosanam, BS

Poster #C050
**Evaluating ChatGPT as a patient education tool for COVID-19-induced olfactory dysfunction**
Elliott Sina, BA

Poster #C051
**WITHDRAWN**

Poster #C052
**Extranodal NK/T-cell lymphoma, nasal type: A diagnostic challenge**
Jee-hong Kim, MD

Poster #C053
**Factors associated with sinonasal epithelial-myoepithelial carcinoma survival outcomes**
Vanshika Narala, BS

Poster #C054
**Factors influencing patient satisfaction in tertiary rhinology clinics**
Michael Yim, MD, FARS

Poster #C055
**Factors influencing surgeon choice for revision sinus surgery: NHIRD study**
Chun-Kang Liao, MD

Poster #C056
**Frontal bone lymphoma masquerading as Pott's Puffy Tumor: A case report**
Jeremy Chee, MBBS

Poster #C057
**Frontal sinus mucocele with advanced orbital complications**
Raisa Chowdhury, MSc

Poster #C058
**Gaseous orbital cellulitis: Case and review**
Keith Conti, MD

Poster #C059
**Gender differences following sinus surgery: A systematic review and meta-analysis**
Matthew Ryan, MD, FARS

Poster #C060
**Gender differences in demographics and research activity of rhinology fellowship directors**
Haris Waseem, BS

Poster #C061
**Gender disparities among speakers at national rhinology conferences: A five-year analysis**
Isabel Snee, BS

Poster #C062
**Geriatric COVID anosmia**
Nicolette Jabbour

Poster #C063
**GLP-1 receptor agonist induced patulous ETD: Case report and review of otologic adverse events**
Kaitlynne Pak, MD

Poster #C064
**Growth rate and management of incidentally found paranasal sinus osteomas**
Allen Luo

Poster #C065
**Human papilloma virus vaccination (HPVV) as adjuvant therapy for sinonasal squamous cell carcinoma(SNSCCa)**
Rhiannon Gillett

Poster #C066
**Image guided sinus surgery for the practitioner: 4 years of experience looking at cost and utility**
Thomas Breinlich, MD

Poster #C067
**Immune checkpoint inhibitors (ICI) induced sinonasal disease: Review of literature and FDA database**
Kaitlynne Pak, MD

Poster #C068
**Impact of CRS on postoperative complications after transphenoidal surgery**
Kevin Herrera, BS

Poster #C069
**Impact of monoclonal antibodies on rates of FESS in CRSwNP**
Mihai Bentan

Poster #C070
**Impact of OD on PROMs and QOL in older adults**
Nicole Kloosterman, MD

Poster #C071
**Impact of traffic on CRS severity**
Snehitha Talugula, BS

Poster #C072
**Impacts of COVID-19 on US academic rhinologists' industry engagement**
Michael Warn, BS

Poster #C073
**Improvement of Bruxism symptoms and its correlation with nasal symptoms after upper airway surgery**
Yusuf M. Gulleth, MD, MPH

Poster #C074
**WITHDRAWN**

Poster #C075
**Inferior turbinate flap for coverage of exposed ICA due to clival osteoradionecrosis**
Priyanka Bisarya, MD

Poster #C076
**Influence of sinonasal pneumatization on frontal sinus inflammation in CRS**
Peiran Zhou, MD, PhD

Poster #C077
**Invasive fusariosis of the skull base mimicking a primary bone tumor: A case report**
Jen Li, Dong, BS

Poster #C078
**Isolated fungal sphenoid sinusitis with lateral rectus palsy xix years post lung transplant**
Mallory Jenkins, BA

Poster #C079
**JNA in an adult resulting in intracranial cyst**
Patricia Loftus, MD, FARS

Poster #C080
**Laboratory measurements and sinus surgery**
Kevin Tie, MD

Poster #C081
**Lamb septum as a model for septoplasty training**
Heather Yeakel, MD

Poster #C082
**Lefort surgery and post-operative septal abnormalities**
Ashley Schemel, MD

Poster #C083
**Lefort surgery role in chronic rhinosinusitis**
Ashley Schemel, MD

Poster #C084
**Machine learning analysis of reddit sinusitis forum**
Aatin Dhanda, BA

Poster #C085
**Malignant transformation of sinonasal and middle ear inverted papilloma: A case report**
Eve-Marie Roy, MD

Poster #C086
**Management of anterior epistaxis - Cost analysis comparing Rapid Rhino and Merocel**
James Fowler, MD

Poster #C087
**Mantle zone lymphoma: A rare presentation of extranodal involvement in the orbital apex**
Kue Lee, BS

Poster #C088
**Marijuana and chronic rhinitis in the all of US database**
Aatin Dhanda, BA

Poster #C089
**Metachronous development of bilateral silent sinus syndrome over a 7-year period**
Hye Rhyn Chung

Poster #C090
**Modified Caldwell-Luc approach to intra-antral pathology**
Brady Anderson

Poster #C091
**Monoclonal antibodies and allergic fungal sinusitis**
Mihai Bentan, BA

Poster #C092
**Nasal septal hybrid perineurioma-schwannoma tumor**
Timothy Fan, MD

Poster #C093
**Nose goes? A case of mucocutaneous leishmania**
Osama Hamdi, MD

Poster #C094
**Novel virtual reality simulator for sinonasal and skull base surgery**
David Ahmadian, BS

Poster #C095
**NSQIP analysis of endoscopic sinus surgery outcomes before and during the COVID-19 pandemic**
Sherron Thomas, BSA

Poster #C096
**Nuances in secondary management of iatrogenic cerebrospinal fluid leak**
David Lerner, MD

Poster #C097
**Odds of epistaxis in AFib patients on oral anticoagulation vs. LAAO**
Shreya Mandloi, BS

Poster #C098
**WITHDRAWN**

Poster #C099
**Olfactory and gustatory dysfunction, the neglected senses in thyroid disease**
Rashida Chatani, BA

Poster #C100
**Optimizing care in chronic rhinosinusitis patients: Diagnostic factors and surgical interventions**
Manisha Naganatanahalli

Poster #C101
**Orbital exenteration in rhino orbital IFS in COVID-19 patients**
Kue Lee, BS

Poster #C102
**Outcomes of shared decision-making among Chinese Americans with chronic rhinosinusitis**
Kevin Hur, MD

Poster #C103
**Outcomes of skull base surgery vs age**
Sarit Dhar, BS

Poster #C104
**Patient perspectives on expert consensus criteria for chronic rhinosinusitis disease control**
Ryan Cotter, BS

Poster #C105
**Peak nasal inspiratory flow and the impact of dupilumab in patients with severe CRSwNP**
Scott Nash, Dr.

Poster #C106
**Pediatric endoscopic skull base surgery: Safety, efficacy, and lessons learned**
Daniel Lander, MD, MSCI

Poster #C107
**Pediatric sinusitis complications- An update**
Christine Settoon, MD

Poster #C108
**Peri-operative management patterns following endoscopic transsphenoidal pituitary surgery**
Dhruv Kothari, MD

Poster #C109
**Perioperative predictors of Dupilumab initiation after prior endoscopic sinus surgery**
Christina Dorismond, MD, MPH

Poster #C110
**Pilot analysis of marketing techniques for a tertiary otolaryngology clinic**
Rose Dimitroyannis, BA

Poster #C111
**Pneumosinus dilatans from aggressive intracranial pressure**
Taylor Erickson, MD

Poster #C112
**WITHDRAWN**

Poster #C113
**Predicting visual acuity recovery in orbital decompression surgery for dysthyroid optic neuropathy**
Forrest Fearington

Poster #C114
**Prescribing practices and barriers of biologics for chronic rhinosinusitis amongst otolaryngologists**
Chris Bell, MD, MPT

Poster #C115
**Primary surgery outcomes: Modified Lothrop vs Draf 2a/b**
Shiv Maharaj, MD

Poster #C116
**Protein expression patterns in sinonasal mucus in primary and secondary chronic rhinosinusitis**
Heidi Martini-Stoica, MD, PhD

Poster #C117
**PRP for extremely long-term anosmia: A case report**
Esther Wang, BS

Poster #C118
**PuraGel versus ChitoGel in vitro**
Jennifer Mulligan, PhD

Poster #C119
**Quantifying post nasal drip**
Aatin Dhanda, BA

Poster #C120
**Radiographic variants in AFRS**
Dylan Erwin, MD

Poster #C121
**Relationship of acute invasive fungal rhinosinusitis with SARS-CoV2: A meta-epidemiological analysis**
Estephania Candelo, MD, MSc

Poster #C122
**Relationship of estrogen exposure and sinonasal symptoms in women**
Snehitha Talugula, BS

Poster #C123
**Revisional FESS rates for CRS between inmates and free world patients**
Kue Lee, BS

Poster #C124
**Rhinitis medicamentosa exacerbation**
Cassidy Anderson, BS

Poster #C125
**Rhinologic complications of pregnancy**
Jacquelyn Callander, MD

Poster #C126
**Rhinologic considerations for the professional aviator**
John Curnes, MD

Poster #C127
**Risk factors for suicidal ideation in patients with skull base tumors: A large cohort analysis**
Tony Chung, MS

Poster #C128
**Schwannoma presenting as skull base mass involving bilateral olfactory clefts and cribriform plate**
Jamie Lewis, M3

Poster #C129
**Sex differences in pre-op and post-op disease severity in chronic rhinosinusitis**
Julian Purrinos, BS

Poster #C130
**Sex differences pre-op and post-op SNOT-22 CRS**
Julisa Nuñez, MS

Poster #C131
**Sinonasal morbidity in transpterygoid versus transsphenoidal approaches to the skull base**
Jasmeet Saroya

Poster #C132
**Sinonasal NUT carcinoma: A systematic review and case report**
David Ahmadian, BS

Poster #C133
**Sinonasal quality of life in primary ciliary dyskinesia**
Theresa Dickerson, MS

Poster #C134
**Sinus surgery in radiation-Associated chronic rhinosinusitis**
Kevin Herrera, BS

Poster #C135
**Skull base pressures with swallowing**
Glen Souza, MD

Poster #C136
**Smoke signals: Internet searches uncover wildfire impacts on sinonasal health**
Stella Lee, MD

Poster #C137
**Social determinant factors of skull-base squamous cell treatment in the US**
David Fei-Zhang, BA

Poster #C138
**Spindle cell lipoma of the nasal mucosa**
Josef Shargorodsky, MD, MPH

Poster #C139
**WITHDRAWN**

Poster #C140
**Sublingual immunotherapy – Get it on Facebook!**
Aurelia S. Monk, BA

Poster #C141
**Surgical & medical management of chronic cocaine use-related rhinology complications: Scoping review**
Jacqueline Slobin, BA

Poster #C142
**Surgical management of headache and facial pain in chronic rhinosinusitis**
Luke Heiland, BS

Poster #C143
**Synthetic material in endoscopic anterior skull base repair**
Eric Liang, Medical Student

Poster #C144
**Telemedicine carbon emission & travel cost reductions**
Hunter Kellerman, BS

Poster #C145
**Temporal, geographic, and socioeconomic factors affect incidence and outcomes in AIFS**
Kristine Smith, MD

Poster #C146
**Tezepelumab improves nasal blockage and smell in patients with nasal polyps and severe asthma**
Joseph K. Han, MD, FARS

Poster #C147
**The association of anxiety with chronic rhinosinusitis in the United States - A population study**
Najm Khan, MBS

Poster #C148
**The effect of hyperbaric oxygen therapy on the sinonasal microbiome**
Galit Almosnino, MD

Poster #C149
**The harmful effects of nutritional supplements and its role in intractable epistaxis**
Chase Kahn, MD

Poster #C150
**The potential perils of gas stoves and volatile organic compounds on sinonasal health**
Stella Lee, MD

Poster #C151
**The prevalence of allergic and non-allergic rhinitis before and after the 2020 Beirut blast**
Christophe Abi Zeid Daou, MD

Poster #C152
**The protective effect of chronic rhinosinusitis in COVID-19 patients**
Andrew Li

Poster #C153
**The relationship between overall symptom severity score and patient-reported chronic rhinosinusitis control**
Ryan Cotter, BS

Poster #C154
**The role of artificial intelligence in rhinology**
Andrew Cunningham

Poster #C155
**The role of inhalant allergens on the clinical manifestations of atopic dermatitis**
Jaekeun Jung, MD, Student

Poster #C156
**The RVU compensation model in rhinologic surgical training**
Mackenzie O'Connor, MD

Poster #C157
**Timing of endoscopic surgery in CRS and patient outcomes: a systematic review and meta-analysis**
Chris Bell, MD, MPT

Poster #C158
**Tophaceous pseudogout presenting as an infratemporal fossa mass**
Ehiremen Iyoha, MD

Poster #C159
**Treatment approach to a case of juvenile psammomatoid ossifying fibroma**
Saima Wase, MD

Poster #C160
**Trends in biologic persistence among CRS patients**
Taylor J. Stack, BS

Poster #C161
**Trends in endoscopic sinus surgery and chronic rhinosinusitis in cystic fibrosis**
Roy Qu, MD

Poster #C162
**Trends in nasal surgery**
Aurelia S. Monk, BA

Poster #C163
**Trends in surgical management of invasive fungal sinusitis before and after the COVID-19 pandemic**
Benjamin Bitner, MD

Poster #C164
**Turbinate surgery in children**
Mattie Rosi-Schumacher, MD

Poster #C165
**Utility of preoperative laboratory testing in elective transnasal pituitary surgery**
Sherron Thomas, BSA

Poster #C166
**Variations in research activity among 2023 rhinology fellows**
Andrew Lee, BA

Poster #C167
**Vasovagal reactions in the office**
Victor Kizhner, MD

Poster #C168
**Vestibular stenosis following nasal cannula fire**
Kue Lee, BS

Poster #C169
**Vivaer: A correlation between symptom scores and objective findings**
Auddie Sweis, MD

Poster #C170
**WITHDRAWN**

Poster #C171
**Wearable heath tech/apps for ENT research-logistics, challenges, and implementation**
Amrita Ray, MD, FARS

Poster #C172
**Web-based patient-generated health data collection tool in rhinologic care**
Mohamed Aboueisha, MD

# ORAL PRESENTATIONS

## Wednesday, May 15, 2024
## Morning Session - Grand Ballroom CD
## 8:00 am – 12:00 pm CST

7:00 am – 8:00 am
**Women in Rhinology Session**
Guest Speaker: Dana. M. Thompson, MD, MS, MBA, FACS
"Allyship in the pathway beyond the 'glass ceiling'"

8:00 am – 8:05 am
**Welcome**
Pete Batra, MD, FARS; Kevin Welch, MD, FARS

### Oral Presentations: Top Basic Science

*Moderators: Benjamin Bleier, MD, FARS; Stella Lee, MD; Elina Toskala, MD, FARS*

8:05 am – 8:13 am
**Calcitriol restores olfactory impairment in mice with smoke induced sinusitis**
Jennifer Mulligan, PhD
Logan Langerude
Carl Atkinson, Professor
University of Florida

Introduction:
Smoking has been shown to be associated with circulating deficiencies in 25(OH)D3. Furthermore, tobacco smoke reduces sinonasal tissue levels of the active form of vitamin D, 1,25(OH)2D3. Given these observations, coupled with vitamin D's well described ability to reduce inflammation, we sought to examine if restoration of sinonasal vitamin D levels with intranasal delivery (IN) of calcitriol [clinical analog of 1,25(OH)2D3] could reduce sinonasal inflammation and improve disease severity.

Methods:
8-week-old Balb/c male mice were exposed to cigarette smoke 5 hours/day, 5 days/week for 9 months. then began receiving IN therapy calcitriol therapy administered 3 times/week for 4 weeks. CT scans were used to assess disease severity. Sinonasal tissues were collected for RNA seq analysis. Olfactory function was assessed using a T-maze odorant avoidance sniff behavior test.

Results:
Quantification of disease severity by CT scan showed that smoking cessation plus vehicle control resulted in a 5% reduction in sinus opacification, as compared to IN calcitriol that reduces opacification by 18%. Because RNAseq analysis found that the pathway most impacted by smoke were genes associated with odorant binding we examined calcitriol's ability to modulate olfactory function. IN calcitriol reversed olfactory loss caused by cigarette smoke exposure and aging with olfactory function similar to 8-week-old, non-smoked mice.

Conclusions:
IN delivery of calcitriol reduced inflammation and improved olfactory functions in mice with cigarette smoke-induced and age-related olfactory loss. IN calcitriol represents a novel and exciting potential therapeutic breakthrough, as there are currently no treatments for olfactory loss.

8:14 am – 8:22 am
**In-clinic eosinophil peroxidase level as a diagnostic test of eosinophilic CRS**
Jacquelyn Callander, MD
Annabelle Charbit, PhD
John Fahy, MD
Kritika Khanna, PhD
Maude Liegeois, PhD
Steven Pletcher, MD
Andrew Goldberg, MD, FARS
Jose Gurrola II, MD
Andrew Murr, MD
Anna Butrymowicz, MD
Patricia Loftus, MD, FARS
University of California San Francisco

Background:
Practical biomarkers for endotypic characterization of chronic rhinosinusitis (CRS) remain elusive, hindering its clinical utility. Eosinophil peroxidase (EPX) is an enzyme release by activated eosinophils. The objective of this study was to evaluate a clinic EPX assay as a marker of eosinophilic CRS.

Methods:
Subjects with and without CRS presenting to a tertiary care rhinology clinic were prospectively enrolled in the study, and nasal cytology brushings were collected from the middle meatus during in-clinic nasal endoscopy. ELISA assay was used to quantify EPX level and a customized multiplex immunoassay was used to quantify inflammatory mediators. Findings were correlated with clinical data.

Results:
42 subjects were enrolled, including 31 CRS subjects and 11 controls. Median EPX levels were 125.0ng/ml (SD 1745.8) and 6.5ng/ml (SD 99.0) for CRS group and controls respectively (p=0.003). EPX levels were positively correlated with history of asthma (p= 0.015) or allergies (p= 0.028), polyps on endoscopy (p= 0.0006), smell loss (p= 0.006), and history of systemic eosinophilia or elevated IgE (p= <0.0001). 28 subjects from both the CRS and control groups had prior pathology for comparison, with histologic confirmation of local tissue eosinophilia (>10 eos/hpf) in 11 subjects. This subgroup had a median EPX level of 967.5ng/ml, compared to 10.6ng/ml in 17 subjects with no significant local tissue eosinophilia (p= 0.0008).

Conclusion:
EPX levels can be measured via well-tolerated in-clinic testing. EPX levels correlate to clinical markers of type 2 inflammation and tissue eosinophilia and may provide a valuable diagnostic tool to delineate eosinophilic CRS.

8:23 am – 8:31 am
**D-2-hydroxyglutarate supresses IgE production in murine allergic rhinitis**
Anuj Tharakan, PhD
Rebecca Martin

Introduction:
Allergic rhinitis (AR) pathophysiology is largely driven by IgE which promotes allergen induced upper airway allergic inflammation. The mechanisms that regulate IgE synthesis in AR, however, are poorly understood. Previous studies associate single nucleotide polymorphisms (SNP) in the D2HGDH gene, which encodes an enzyme that converts D-2-hydroxyglutarate (D2HG) to α-ketoglutarate (α-KG), with AR. This study aims to clarify the relationship between AR and SNP in D2HGDH.

Methods:
The regulatory landscape of D2HGDH was analyzed using the ENCODE database. Next, mice were treated with D2HG or vehicle control prior to intranasal exposure to the allergen Alternaria. Draining lymph nodes (dLNs) were then analyzed for IgE synthesis and T cell polarization. Next, mice received intranasal Alternaria on days 0, 10, 20, and 27-30 and were treated intranasally with or without D2HG. Nasal inflammation was analyzed by nasal lavage (NL) cellularity and local IgE production.

Results:
Analysis of rs34290285, the sentinel SNP in the D2HGDH locus associated with AR, revealed that this SNP lies in enhancer-like regions. Administration of D2HG prior to Alternaria exposure suppressed IgE synthesis ($p<0.01$) and Th2 cell polarization ($p<0.01$) in dLNs. In a murine model of AR, D2HG administration reduced antigen specific IgE in NL ($p<0.05$).

Conclusions:
Analysis of the regulatory landscape surrounding the rs34290285 SNP demonstrates that downregulation of D2HGDH expression reduces the risk of AR. Downregulation of D2HGDH results in accumulation of D2HG. Administration of D2HG impairs IgE production in mice. D2HG inhibits 2-oxoglutarate-dependent enzymes, suggesting that these enzymes may represent therapeutic target for AR.

8:32 am – 8:40 am
**Complement activation correlates with impaired olfactory function in CRSwNP**
Jennifer Mulligan, PhD
Sufiya Ali, BA
Maria Villanova, Lab Technician
Jeb Justice, MD, FARS
Brian Lobo, MD, FARS
Nikita Chapurin, MD
Carl Atkinson, Professor
University of Florida

Introduction:
The mechanisms that contribute to CRSwNP-related olfactory loss are poorly characterized. We have previously shown in middle meatus mucus that levels of C3, a component of the complement system, are elevated and correlate with worse SNOT22 score. Excessive complement activation has been shown to impact the severity and progression of injury in the visual and auditory sensory systems but has yet to be investigated in olfaction and thus the focus of this study.

Methods:
Mucus from the olfactory cleft was sampled from CRSwNP patients (n=22) undergoing endoscopic sinus surgery. Olfactory status was determined by UPSIT. Patients were categorized into two groups: normosmic/mild microsmic (n=10) and moderate microsomia/total anosmia (n=12). Mucus concentrations of classical (C1q), lectin (MBL), alternative pathway (fB, Adipsin), complement proteins (C2, 4, 3, and 5), activation fragments (C4b, C3a, C3b, C5a), and soluble regulators (Factor I and H) were assessed by multiplex and ELISA techniques.

Results:
CRSwNP patients with olfactory loss had higher MBL, C2, C4, C3, fB, and Adipsin levels, suggesting lectin and alternative pathway involvement. Complement activation was present and significantly increased in microsomia/total anosmia patients as determined by the presence C4b, C3a, and C3b complement cleavage fragments. No differences in terminal pathway proteins, C5 or C5a, were noted. Fluid phase complement inhibitors, factor I and H, were elevated, representative of increased complement activity.

Conclusion:
Components of the lectin and alternative pathway are locally elevated in CRSwNP patients with olfactory loss. Our findings create a precedent for investigating complement mechanisms in olfactory loss.

8:41 am – 8:49 am
**The role of MMP-11 in inverted papilloma migration and transformation**
Kush Panara, MD
Tan Li Hui, Postdoctoral Fellow
Deepa Keshari
Charles Tong, MD, FARS
Jennifer Douglas, MD
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS
Noam Cohen, MD, FARS
Michael A. Kohanski, MD

Background:
Inverted papilloma (IP) is a benign tumor characterized by epithelial proliferation which has the potential for malignant transformation. However, the mechanisms driving this transformation are poorly defined. Matrix metalloproteinase-11 (MMP-11), which is known to degrade the extracellular matrix and regulate the tumor microenvironment in many cancers, is upregulated in IP with dysplasia. Here, we aim to investigate the role of MMP-11 in IP.

Methods:
Human IP and contralateral normal sinus mucosa (control) samples were obtained. IP and control cultures were grown at air-liquid interface (ALI) followed by western blot (WB) and immunofluorescence (IF) to assess MMP-11 expression in IP. Epithelial migration in IP and control cultures treated with anti-MMP-11 was assessed using a transwell migration and wound healing assay.

Results:
IP-derived cultures were found to be non-ciliated and with increased MMP-11 as compared to ciliated controls. Treatment with anti-MMP-11 reduced epithelial migration only in IP-derived cells compared to non-treated IP cells (88 cells/high powered field (HPF) vs 294 cells/HPF, $p < 0.01$). Anti-MMP-11 treatment also reduced wound healing compared to no treatment only in IP samples, as seen by decreased wound closure at 48 hours (117.3 pixels vs 0 pixels, $p < 0.01$) and reduced transepithelial resistance (16.2% reduction, $p = 0.03$).

Conclusion:
We demonstrate the ability to culture IP-derived epithelial cells in ALI which can serve as an in-vitro IP model. We demonstrate that MMP-11 is specifically expressed in IP compared to control mucosa. Furthermore, anti-MMP-11 treatment affected IP-derived cell migration and had no impact on control suggesting that MMP-11 has a specific function in IP.

8:50 am – 8:55 am
**Q&A**

8:56 am – 9:05 am
**Awards Ceremony**
Jean Kim, MD, FARS

9:05 am – 9:45 am
**PANEL: Targeted ESS plus Biologics vs. Complete ESS and Local Therapies – False Choice or Our Future?**
Moderator: James Palmer, MD, FARS
Panelists: David Gudis, MD, FARS; Douglas Reh, MD, FARS; Sarah Wise, MD, FARS

9:45 am – 10:15 am
**Break with Exhibitors**

## Oral Presentations: Top Clinical Abstracts

*Moderators: Adam DeConde, MD; Angela Donaldson, MD, FARS; Ashleigh Halderman, MD, FARS*

10:15 am – 10:23 am
**Long term air pollution and genetic predisposition in chronic rhinosinusitis**
Murugappan Ramanathan, MD, FARS
Omar Ahmed, MD, FARS
Shyam Biswal
Nicholas Rowan MD
Nyall London, MD, FARS
Charles Riley, MD
Stella Lee, MD
Jayant Pinto, Dr.
Zhenyu Zhang
Qinfeng Zhao
Junxiong Ma
Johns Hopkins

Background:
Chronic rhinosinusitis (CRS) is a prevalent upper respiratory condition that has a multifactorial etiology with a new emphasis on environmental factors. While previous studies have reported a correlation between air pollution and developing CRS, the role of genetic predisposition in this relationship remains largely unexplored.

Methods:
We conducted a comprehensive study involving 369,489 adult participants from the UK Biobank, followed from March 2006 to October 2021. Air pollution metrics (PM2.5,PMcoarse, PM10,NOx,NO2) were estimated at residential locations using land-use regression models. We examined the associations between air pollution exposure and CRS, CRSwNP, and CRSsNP. A polygenic risk score (PRS) was also employed to evaluate the joint effect of air pollution and genetic predisposition on developing CRS.

Results:
Our analysis revealed that long-term air pollution exposure increased the risk of CRS. Specifically, the hazard ratios (HRs) with 95% CIs for PM2.5, PM10, and NO2 were 1.49 (1.18-1.89), 1.75 (1.34-2.27), and 1.18 (1.11-1.25), respectively. Additionally, individuals with a higher genetic predisposition to CRS showed amplified risks when exposed to air pollution: HRs with 95% CIs for PM2.5, PM10, and NO2 were 1.40 (1.17-1.66), 1.40 (1.18-1.68), and 1.85 (1.45-2.37), respectively. This interactive effect was more pronounced among individuals with CRSwNP.

Conclusions:
In this cohort study, which is one of the largest of its kind to our knowledge, we demonstrate that long-term exposure to air pollution increases the risk of CRS, particularly CRSwNP. This risk is further accentuated by genetic factors, underscoring the need for multifaceted public health strategies aimed at improving air quality.

10:24 am – 10:32 am
**An eosinophil peroxidase activity assay predicts acute exacerbations in post-operative CRS**
Conner Massey, MD
Kristine Smith, MD
Richard Orlandi, MD, FARS
Gretchen Oakley, MD, FARS
Shaelene Ashbey, PhD
Jeremiah Alt, MD, PhD, FARS
Abigail Pulsipher, Assistant Professor
University of Utah

Background:
Eosinophil peroxidase (EPX) has been established as a biomarker of eosinophilic inflammation in chronic rhinosinusitis (CRS). Prior work has developed and validated an assay that measures EPX activity with high accuracy for diagnosing eosinophilic CRS. This study assessed the ability of the EPX activity assay to predict post-operative outcomes in patients with CRS.

Methods:
Adult patients with CRS undergoing endoscopic sinus surgery (ESS) were enrolled into an observational cohort study. Demographic and clinical outcomes data were collected, including medication usage and revision ESS rates. EPX activity and tissue eosinophil counts were collected during ESS and correlated with clinical outcomes. Participants who were lost to follow up at their first post-operative visit were excluded.

Results:
Forty-seven patients with CRS (n=33, eCRS; n=14, non-eCRS) were enrolled and followed for a median of 266 days (range: 9-2056 days). EPX activity was significantly correlated with post-operative antibiotic ($r=0.37$, $p<0.05$) and oral corticosteroid (OCS) ($r=0.44$, $p<0.01$) usage. The correlation between EPX activity and revision ESS rates was not significant ($r=0.18$, $p>0.1$). Tissue eosinophil counts were correlated with OCS usage ($r=0.52$, $p<0.0001$) but not with antibiotic usage ($r=0.16$, $p>0.2$).

Conclusion:
EPX activity correlates with increased post-operative antibiotic and OCS usage in CRS and more accurately predicts medication utilization compared to tissue eosinophil counts. This suggests that EPX activity may serve as a predictive marker for acute exacerbations in CRS, underscoring the need for temporal assessments of inflammation. These results may have clinical implications for patient counseling and post-operative management.

10:33 am – 10:41 am
**Characterizing conflicts of interest in biologics literature for CRSwNP**
Christina Liu, MS
Conrad Safranek, Medical Student
Rhys Richmond, Medical Student
Trinithas Boyi, Medical Student
Ryan Rimmer, MD, FARS
R. Peter Manes, MD, FARS
Yale School of Medicine

Background:
Accurate conflict of interest (COI) information is essential for assessing bias in research, especially for novel biologics which carry a significant potential for industry influence. We aim to assess COI disclosure patterns in biologics research for chronic rhinosinusitis with nasal polyposis (CRSwNP) using the CMS Open Payments Database (OPD).

Methods:
Studies on FDA-approved biologics for CRSwNP (dupilumab, omalizumab, mepolizumab) published in or after 2019 with at least one US author were identified through PubMed. Industry-reported payments from the manufacturers (Sanofi, Regeneron, Genentech, Novartis, GlaxoSmithKline) between 2018-2021 in OPD were collected for each author's name. For each name match, ChatGPT was used to cross-check author affiliation with OPD payment metadata. ChatGPT was additionally used to analyze COI statements for relevant author-company specific disclosures. Undisclosed payments made 3-15 months before publication without COI disclosure were identified.

Results:
271 authors from 76 studies were included. In total, 144 authors (53.1%) from 56 studies (73.7%) declared relevant COIs. 21 articles (27.6%) were found to have an undisclosed COI, with a mean total payment of $5,740 and median of $10,944. Interestingly, only 56 authors had relevant payments documented in OPD. Of these, 40 authors who had a documented payment did not declare a COI. Undisclosed payments to authors averaged $5,745 with a maximum of $61,368.

Conclusion:
This study characterizes COI disclosure patterns in rhinosinusitis-relevant biologics research using a novel automated approach. Given the discrepancy between disclosures and industry-reported payments, our findings suggest a need for improved monitoring of COIs.

10:42 am – 10:50 am
**CRS type 2 biomarkers correlate with baseline SNOT-22 rhinologic domain independent of nasal polyp status**
Nikita Chapurin, MD, MHS
Zachary Soler, MD, FARS
Sofia Khan, Clinical Research Fellow
Jess Mace, MPH CCRP
Jorge Gutierrez, Mr.
Timothy Smith, MD, MPH, FARS
Jennifer Mulligan
Jose L. Mattos, MD, MPH
Jeremiah Alt, MD, PhD, FARS
Vijay Ramakrishnan, MD, FARS
Rodney Schlosser, MD, FARS
University of Florida

Background:
Significant discrepancies can be observed between objective measures of chronic rhinosinusitis (CRS), such those based on CT imaging and endoscopy, and patient reported outcome measures (PROMs). Baseline cytokine levels may be used in the future to predict symptom severity and PROMs.

Objective:
Assess the correlation between preoperative baseline mucus cytokine levels and baseline Sino-Nasal Outcome Test (SNOT-22) scores, as well as individual sub-domains.

Methods:
Patients with CRS were prospectively recruited between 2016-2021 into a multi-institutional observational study. Mucus was collected from the olfactory cleft and evaluated for 26 biomarkers. Patient-reported outcome measures were assessed with the SNOT-22. Spearman correlations between cytokines and quality-of-life subdomain scores were examined.

Results:
A total of 127 patients were enrolled in the study (CRSsNP=53, CRSwNP=74). Overall, there was no significant correlation between individual cytokines and overall SNOT-22 scores, except for IL-9 ($R=0.196$, $p<0.05$) and CCL2 ($R=0.195$, $p<0.05$). Type 2 mediators IgE, IL-5, IL-9 and IL-13 showed significant correlation with rhinologic specific subdomain scores of SNOT-22 ($p<0.001$), but not other sub-domains. Furthermore, preoperative levels of cytokine expression and preoperative SNOT-22 rhinologic domain symptom scores correlated with individual symptoms scores. Interestingly, subgroup analysis showed that even in CRSsNP, type 2 mediators correlated with the rhinologic domain and individual question scores.

Conclusion:
Nasal mucous cytokine levels, especially type 2 mediators, appear to correlate with the rhinologic SNOT-22 domain and individual symptoms scores for both CRSsNP and CRSwNP patients.

10:51 am – 10:59 am
**Oxymetazoline to predict turbinate reduction surgery outcome: prospective, single-blinded, CFD study**
Zachary Root, BS
Thomas Lepley
Zhenxing Wu
Aspen Schneller, Undergraduate Research Assistant
Robbie Chapman, Undergraduate Research AssistanT
Veronica Formanek
Kathleen Kelly, MD
Bradley Otto, MD
Kai Zhao, Associate Professor
The Ohio State University Wexner Medical Center

Background:
A patient's subjective response to decongestant is often used to screen their suitability for turbinate reduction surgery, however, this has not been objectively evaluated and the decongested and surgical nasal airways have not been aerodynamically compared.

Methods:
Prospective, longitudinal, single-blinded cohort study employing Computational Fluid Dynamics based on CT scans at baseline, 30 minutes post-oxymetazoline (afrin), and two months post-op in 11 patients.

Results:
Nasal obstruction symptom evaluation (NOSE) and visual analogue scale of obstruction (VAS) scores significantly improved baseline to post-afrin to post-op, with significant correlation between the latter two (NOSE: 71.82±14.19 to 42.27±25.26 to 22.27±21.04, each interaction $p<0.05$; VAS: 6.09±2.41 to 4.14±2.20 to 2.08±1.56, each $p<0.05$, $r=0.477$, $p<0.05$). Afrin had broader inferior and middle turbinate anatomical impact than surgery ($p<0.05$); however, improvements in regional airflow were similar ($p>0.05$) and mainly limited to the inferior turbinate. Significant post-afrin to post-op correlations were observed in decreased nasal resistance ($r=0.816$, $p<0.05$), increased regional airflow rates ($r=-0.3$ to $-0.5$, $p<0.05$) and regional air/mucosa shear force and heat flux ($r=0.5$-$0.7$, $p<0.05$); however, only increased regional airflow rates (NOSE and VAS: $r=0.298$-$0.324$, $p<0.05$) and peak heat flux (NOSE: $r=0.439$. VAS: $r=0.477$, $p<0.05$) significantly correlated to symptom score improvement.

Conclusion:
We present the first objective evidence that the "decongestant test" can help predict turbinate reduction surgery outcome, which is driven by improvement in regional airflow rates and air/mucosa interactions (heat flux/shear force) rather than nasal resistance.

11:00 am – 11:05 am
**Q&A**

11:05 am – 11:55 am
**Panel: Air Pollution and Particulate Matter: Implications in Upper and Lower Airway Disease**
Moderator: Reagan Bergmark, MD, FARS
Panelists: G.R. Scott Budinger, MD; Peter Hwang, MD, FARS; Stella Lee, MD; Murugappan Ramanathan, MD, FARS

11:55 am – 12:00 pm
**Q&A**

12:00 pm – 1:00 pm
**Lunch with Exhibitors**

## Wednesday, May 15, 2024
## Afternoon Session – Grand Ballroom CD
## 1:00 pm – 5:00 pm CST

*Moderators: Michael Kohanski, MD; Kristine Smith, MD*

1:00 pm – 1:06 pm
**Predictors of control in biologic treated eosinophilic chronic rhinosinusitis**
Lu Hui Png, MD
Singapore General Hospital

Background:
Biologic therapy targeting type 2 chronic rhinosinusitis with nasal polyps (CRSwNP) has greatly improved disease control but non-responders exist in a proportion of patients in phase 3 trials and clinical practice. This study explores the serum and histologic changes in biologic treated CRSwNP that predict disease control.

Methods:
A cross-sectional study was performed of patients with CRSwNP on biologics for their asthma, who underwent endoscopic sinus surgery while on biologic therapy. At the 6-month postoperative assessment, patients with poorly controlled CRSwNP while on biologic therapy were compared to patients who were controlled. Blood and mucosal samples taken at the time of surgery 6 months prior were assessed to predict disease control.

Results:
37 patients were included (age 47.8±12.4 years, 43.2% female). Those with poorly controlled disease had reduced tissue eosinophils (% >100 cells/high-powered field: 8.3% vs 50.0%, p <0.001), and increased serum neutrophils (5.2±2.7 vs 3.7±1.1 x109 cells/L, p = 0.02). Logistic regression analysis demonstrated that reduced tissue eosinophil was predictive for poorly controlled disease (OR = 0.21, 95% CI [0.05, 0.83], p = 0.03). Receiver operating characteristic analysis showed that need for rescue systemic corticosteroid was predicted at a serum neutrophil cut-off level of 5.75 x109 cells/L (sensitivity = 80.0%, specificity = 96.9%, AUC = 0.938, p = 0.002).

Conclusion:
Low tissue eosinophils and increased serum neutrophils while on biologics predict for poor response in the biological treatment of with CRSwNP. A serum neutrophil level of ≥5.75 x109 cells/L predicts for poor response to current biologic therapy.

1:07 pm – 1:13 pm
**Need for biologic rescue in CRSwNP following endoscopic modified lothrop procedure**
Keven Ji
Hunter Kellerman
Jess Mace, MPH, CCRP
Timothy Smith, MD, MPH, FARS
Kara Detwiller MD, FARS
Harish Dharmarajan, MD
Mathew Geltzeiler, MD, FARS
Oregon Health and Science University

Background:
The indications for endoscopic modified Lothrop procedure (Draf 3) in patients with refractory chronic rhinosinusitis with nasal polyposis (CRSwNP) remain unclear. This study evaluates the effectiveness of Draf 3 for refractory CRSwNP focusing on improvements in disease severity and need for subsequent biologic therapy rescue.

Methods:
Retrospective review of patients with CRSwNP undergoing Draf 3 surgery at a tertiary center between 2012 and 2022. Clinicodemographic variables were compared across those who did vs. did not require rescue with postoperative biologic. Time to postoperative biologic rescue was analyzed and longitudinal disease-specific outcomes were measured using the SinoNasal Outcomes Test (SNOT-22).

Results:
Of 87 patients with CRSwNP, 24% had aspirin exacerbated respiratory disease (AERD). Significant improvement in SNOT-22 score was found in

CRSwNP with AERD (p<0.001) and without AERD (p=0.01) up to 24 months post-op. 15% eventually required rescue with a biologic. More specifically, of 21 patients with AERD, 24% eventually required rescue with a biologic. Biologic rescue was associated with a greater number of prior sinus surgeries (p=0.02), prior aspirin desensitization (p=0.02) and worse preoperative Lund-MacKay scores (p<0.001). No association between biologic rescue and frontal recess antero-posterior diameter was found (p=0.20).

Conclusions:
Draf 3 surgery in CRSwNP was associated with significant improvement in SNOT-22 score at 24 months. Furthermore, only 15% of patients required biologic rescue. Patients with AERD were more likely to require biologic rescue even though 76% avoided treatment with biologic.

1:14 pm – 1:20 pm
**Chitosan-based encapsulation for controlled topical drug release in rhinosinusitis**
Do-Yeon Cho, MD
Dong Jin Lim, PhD
Daniel Skinner, BS
Jessica Grayson, MD
Bradford Woodworth, MD, FARS
University of Alabama at Birmingham

Introduction:
Sustained topical drug release leads to positive clinical outcomes in chronic rhinosinusitis (CRS). Chitosan, a natural polysaccharide obtained mainly from marine crustaceans, is a promising drug delivery vector for therapeutics owing to its biocompatibility and low toxicity. The aim of this study was to characterize the release profiles of ciprofloxacin and triamcinolone acetonide (TA) with chitosan encapsulation based on their water solubility.

Methods:
Ciprofloxacin (hydrophilic) and TA (hydrophobic) were encapsulated within cross-linked chitosan and characterized by zeta potential and scanning electron microscopy. To mimic the topical placement of the drug on the nasal mucosa, punch biopsies (4 mm) of ovine forestomach tissue on transwell filters were impregnated with ciprofloxacin (0.2 mg) or TA (1.0 mg), and drug release was characterized over time.

Results:
Chitosan-encapsulated ciprofloxacin exhibited a delayed burst release (44.3±8.0%) compared to the control (73.5±16.5%) on day 1. Approximately 80% of the chitosan-encapsulated drug was released by day 3. There was no difference in immediate release profiles between chitosan-TA and non-chitosan-encapsulated TA by day 2 (40% of TA was released in both groups). However, chitosan-TA demonstrated sustained release after day 3 compared to control TA (94.8±8.7% on day 7 vs. control 95.7±5.9% on day 3).

Conclusions:
Our findings demonstrated that once encapsulated with chitosan, prolonged drug release was observed regardless of water solubility. However, hydrophilic drugs were released quickly, requiring repeated administration. This in vitro study could provide guidance when applying off-label topical drugs in CRS.

1:21 pm – 1:27 pm
**FDA-approved biologics for chronic rhinosinusitis with nasal polyps: An analysis of FAERS data**
Radhika Duggal, MA
Mohamad Chaaban, MD, FARS

Introduction:
Dupilumab, Mepolizumab, and Omalizumab are biologics approved in the last five years to treat chronic rhinosinusitis with nasal polyps (CRSwNP). This study is the first to compare their adverse event profiles.

Methods:
The FAERS was queried for adverse events (AEs) from 2019Q1 to 2023Q2 in adults. Events were categorized and compared between biologics for comparison of AE type and severity. Chi square tests compared outcomes between groups and regression modeling identified predictors of a severe AE (SAE).

Results:
We identified approx. 79,000 AE logs consisting of approx. 226,000 individual adverse reactions (IARs). 13%, 55%, and 54% of all AE logs were categorized as “serious” for dupilumab, mepolizumab, and omalizumab respectively. For dupilumab, most IARs were dermatologic (24%) or administration/medical-error related (19%). For mepolizumab, most were administration/medical-error related (20%) or pulmonary (19%). For omalizumab, most were multisystem/not elsewhere classified (19%) or administration/medical-error related (14%). We found mepolizumab (OR 3.61, CI 3.29-3.98) and omalizumab (OR 15.33, 95% CI 13.98-16.81) had a greater odds of an SAE compared to dupilumab. Though more females reported having an AE, males had a 15% greater odds of an SAE (OR 1.17, 95% CI 1.12-1.23). Finally, for each 10-year increase in age, the odds of a SAE increased by 26% (OR 1.26, 95% CI 1.24-1.28).

Conclusion:
We found differences in the AE profiles of FDA Approved biologics. Predictors associated with a severe AEs to be biologic type, sex, age, and prescription indication. This data is important to providers deciding between biologics and educating their patients to potential adverse events.

1:28 pm – 1:34 pm
**Histopathology of recalcitrant maxillary sinusitis requiring endoscopic medial maxillectomy**
Vidit Talati, MD, MS
Ali Baird, BS
Paolo Gattuso, MD
Mary Allen-Proctor, MD
Peter Papagiannopoulos, MD
Pete Batra, MD, FARS
Peter Filip, MD
Bobby Tajudeen, MD, FARS

Background:
Endoscopic medial maxillectomy (EMM) is an effective intervention for patients with recalcitrant maxillary sinusitis after previous middle meatal antrostomy. The pathophysiology of refractory maxillary sinusitis is incompletely understood. Structured histopathology (SHP) may help elucidate how tissue architecture changes contribute to refractory sinusitis and impaired mucociliary clearance.

Methods:
All patients who underwent EMM or standard maxillary antrostomy for recalcitrant maxillary sinusitis of various forms were included. Retrospective chart review was conducted to collect information on demographics, disease characteristics, comorbid conditions, culture data, and SHP reports. Chi-squared and logistic regression analyses were performed for SHP variables.

Results:
41 patients who underwent EMM and 464 patients who underwent maxillary antrostomy were included. On average, the EMM cohort was 10 years older (60.9 years vs. 51.1 years; p = 0.001) and more often had a history of prior sinus procedures (73.2% vs. 40.9%; p < 0.001). EMM patients had higher rates of fibrosis (34.1% vs. 15.1%, p = 0.002), and this remained statistically significant when controlling for prior sinus procedures and nasal polyposis (p = 0.001). Cultures positive for pseudomonas aeruginosa (38.2% vs. 5.6%, p < 0.001) and coagulase negative staphylococcus (47.1% vs. 23.5%, p = 0.003) were more prevalent in the EMM group.

Conclusion:
Fibrosis and bacterial infections with Pseudomonas and coagulase negative Staphylococcus were more prevalent in patients requiring EMM. This may contribute to the multifactorial etiology of impaired mucociliary clearance in patients with recalcitrant maxillary sinusitis.

1:35 pm – 1:41 pm
**Trends in Dupilumab utilization for nasal polyposis**
Daniel Xiao
Martin Citardi, MD, FARS
Amber Luong, MD, PhD, FARS
William Yao, MD, FARS
Jason Talmadge, MD, FARS

Background:
Since its approval, dupilumab has emerged as an important therapy for chronic rhinosinusitis with nasal polyps (CRSwNP). Anecdotally, many otolaryngologists have noticed an increased prevalence of duplimab as first line therapy. In this report, we examine dupilumab practice patterns.

Methods:
Using Epic's Cosmos database, 1,808,599 patients with CRSwNP were identified between May 2020 to April 2023. Further queries identified department specialty (ENT, pulmonologist, or allergist) associated per encounter and the presence of active dupilumab prescriptions at the time of each encounter. Patients with atopic dermatitis were excluded from analysis.

Results:
Percentage of encounters with patients prescribed dupilumab increased over the 3-year period at a rate of 0.01% per month (p<0.001, Confidence Interval [CI] 0.009% to 0.015%). The percentage of encounters with patients who had undergone ESS 12 months prior to starting dupilumab significantly decreased. Percentage of encounters with patients prescribed dupilumab increased at a higher rate for allergists (0.21% per month, p<0.001, [CI] 0.161 to 0.260) compared to pulmonologists (0.06% per month, p=0.026, [CI] 0.013 to 0.111) and ENTs (0.03% per month, p=0.006 [CI] 0.009 to 0.0494).

Conclusions:
Increased encounters with CRSwNP patients with dupilumab likely indicate increased prescription rates. Moreover, more of these patients are being managed by non-surgical specialties. Coupled with the finding that fewer patients are receiving recommended ESS 12 months prior to starting dupilumab, our results suggest that dupilumab is being used as first-line therapy for CRSwNP at an increasing rate. Prescriber data is needed to further explore these relationships.

1:42 pm – 1:48 pm
**Prevalence of primary humoral immunodeficiency based on CRS endotype**
Chioma Anidi, BA
Madison Epperson, MD
Yena Kang
Alan Baptist, MD, MPH
Mark Zacharek, MD, FARS
University of Michigan

Introduction:
The role that primary humoral immunodeficiency plays in chronic rhinosinusitis (CRS) is not fully understood, and it is unknown how endotype (Type 2 or Non-Type 2) affects the association with immunodeficiency. In a prospective trial, we sought to identify differences in the prevalence of primary humoral immunodeficiency in patients with medically refractory CRS who required sinus surgery as stratified by endotype.

Methods:
Subjects seen from 2018-2022 who underwent sinus surgery for a primary diagnosis of CRS, as defined by clinical symptoms and objective findings, were recruited. Endotype status was based on elevated serum eosinophil count >300/uL or IgE >150 kU/L. 56 subjects obtained quantitative IgG, IgA, IgM levels and baseline pneumococcal titers (23-valent). Subjects with low baseline titers (<70% above 1.3) received the pneumococcal polysaccharide vaccination. Post-vaccination titers were acquired 6 weeks later. Presence of a primary humoral immunodeficiency was classified based on the subject's IgG, IgA, and pneumococcal response.

Results:
Of the 40 subjects who completed the protocol, 27 (67.5%) were classified as Type 2 and 13 (32.5%) Non-Type 2 endotype. 14 (35%) subjects had an impaired immune response to a polysaccharide vaccination of which 6 subjects had CVID and 8 subjects had SAD. There was a significant predominance of subjects with Type 2 endotype (13/14) among those with immunodeficiency ($p<0.05$).

Conclusion:
Individuals with CRS that require surgery commonly have primary humoral immunodeficiency, and these immunodeficient individuals are significantly more likely to have Type 2 endotype. Further work is needed to best screen, identify and treat patients prior to and following surgery.

1:49 pm – 1:55 pm
**Q&A**

*Moderators: Charles Ebert, MD, FARS: R. Peter Manes, MD, FARS*

1:56 pm – 2:02 pm
**Examining race and chronic rhinosinusitis' effects on asthma in unified airway diseases**
Evan Patel, MS
Donyea Moore
Mahboobeh Mahdavinia, MD, PhD

Background:
While SES is a well-known significant social determinant of health, race also plays a role in health outcomes. The full scope of asthma control in African American patients with CRS+asthma remains unexplored. We sought to discern asthma control differences in CRS+asthma vs. asthma-only patients, stratified by race.

Methods:
To compare the disease burden of CRS+asthma versus asthma alone, as well as the impact of race on both of these patient populations, we have conducted a longitudinal, prospective study at a tertiary care center which followed 423 asthma and CRS+asthma patients: 185(43.7%) African American and 238(56.3%) White. Of the group, 126(29.8%) had asthma-only, while 297(70.2%) had CRS+asthma.

Results:
Controlling for demographics, insurance, and allergic rhinitis, the asthma-only group had lower odds of asthma-related hospitalization ($p=.001$) and ACT scores below 19 ($p<.0001$) than the CRS+asthma group. In the asthma-only group, AA patients had higher odds of asthma-related ED visits than White patients ($p=.016$). AA patients in the CRS+asthma group also had increased odds of asthma-related hospitalizations compared to White counterparts ($p=.032$).

Conclusions:
Our study shows that race significantly impacts asthma and CRS outcomes. Tailored management strategies have the potential to improve asthma and CRS outcomes, especially in addressing the disparities observed among African American patients. Moreover, our findings underscore the importance of unified-airway disease management in enhancing asthma outcomes in those with CRS+asthma comorbidity. These insights emphasize the need for personalized interventions and comprehensive approaches to optimize patient outcomes in CRS+asthma.

2:03 pm – 2:09 pm

**Social factors associated with treatment completion in aspirin-exacerbated respiratory disease**

Shravan Asthana, BS
Alan Workman, MD
David Lerner, MD
Dana Lopez, Ms.
Rani Randell, Ms.
Michael A. Kohanski, MD
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS
Jennifer Douglas, MD
John V. Bosso, MD, FARS
Northwestern University Feinberg School of Medicine

Background:
Aspirin (ASA) desensitization is a two-day, in person AERD treatment that may present a logistical challenge for vulnerable patients. Our study investigates whether neighborhood-level disadvantage, demographics, or environmental pollution are associated with ASA desensitization completion.

Methods:
A retrospective study compared AERD patients declining ASA desensitization to matched patients completing treatment from 2005 to 2023. Demographic variables were collected, and 2021 area deprivation index (ADI), social vulnerability index (SVI), and environmental justice index (EJI) metrics were applied based on patients' home address. Statistical analyses included linear and logistic regression, Pearson's correlation test, student's t-test, and one-way ANOVA.

Results:
87 total patients were included in this study, of which 38 (44%) declined ASA desensitization. Average age was 45.87 years at AERD diagnosis and patients were mainly female (59%), white (74%), and privately insured (77%). On univariate logistic regression Black race (OR=0.23, p=0.040) and household characteristics SVI (OR=0.19, p=0.047) were associated with significantly decreased odds of ASA desensitization. On multivariate analysis, Black race (OR=0.20, p=0.050) remained significant. Age at AERD diagnosis was negatively correlated with ADI (r=-0.285, p=0.008), socioeconomic status SVI (r=-0.320, p=0.003), and overall SVI (r=-0.222, p=0.039) on Pearson's correlation test. A significantly higher age at AERD diagnosis was noted in patients with public insurance than private insurance (53.5 vs 43.6, p=0.022).

Conclusion:
Race, neighborhood disadvantage, and insurance may mediate ASA desensitization completion rates as well as AERD diagnosis age.

2:10 pm – 2:16 pm

**Frailty is associated with endotypic shifts in cytokine profiles in chronic rhinosinusitis**

Mason Krysinski, MD
Yash Trivedi
Christina Dorismond
Rory Lubner, MD
Kolin Rubel, MD
Andrea Lopez
Rakesh Chandra, MD, FARS
Naweed Chowdhury, MD, MPH
Justin Turner, MD, PhD, FARS
Vanderbilt University Medical Center

Background:
The modified 5-item frailty index (mFI-5) is a validated co-morbidity risk stratification tool, which has been associated with surgical outcomes in chronic rhinosinusitis (CRS). This study sought to understand the effects of frailty, as measured by the mFI-5, on the inflammatory characteristics of patients with CRS.

Methods:
Sinonasal mucus cytokine data was prospectively collected from patients with chronic rhinosinusitis with (CRSwNP) and without (CRSsNP) nasal polyps undergoing endoscopic sinus surgery (ESS). The mFI-5 was calculated for each patient according to their comorbidities. Demographic data, mFI-5, and polyp status were analyzed relative to the mucus cytokine and inflammatory profile using log-normalized multivariable regression models.

Results:
A total of 319 patients with CRS met criteria for analysis (CRSsNP, n=133; CRSwNP, n=186). We observed statistically significant associations between mFI-5 and elevated mucus IL-1β and IL-8 levels, as well as decreases in IL-5, IL-9, and IL-13 with increased frailty ($p<0.05$). After controlling for age, increasing mFI-5 scores were independently associated with decreased IL-5 and IL-9 and increased IL-8 levels ($p<0.05$), suggesting that frailty may be more closely linked with cytokine profile than biologic age.

Conclusions:
Frailty is associated with higher type 1 cytokines and lower type 2 cytokines in patients with CRS. These findings may provide further insight into the relationship between frailty, biological age, and inflammatory burden.

2:17 pm – 2:23 pm
**Sniffing out frailty: A prospective case-control study assessing olfactory subdomains and frailty**
Michael Cheng, MD
Varun Vohra
Hang Wang
Akhil Katuri
Qian-Li Xue; Nicholas Rowan, MD

Background:
Accessible methods for detecting frail individuals are needed to treat an aging and increasingly frail population. Olfactory identification (OI) is an indicator of central olfaction and a known predictor of frailty and mortality, but the relationship between frailty and the peripheral olfactory subdomains of discrimination (OD) and threshold (OT) remains unclear. Here, the association between olfactory subdomains and the physical frailty phenotype (PFP) is examined to investigate olfactory evaluation as a means of screening for frailty.

Methods:
Prospective case-control study of 45 frail and 45 non-frail individuals matched by age and sex. OT, OD, OI, and composite sum (TDI, range 0-48) were measured with Sniffin' Sticks. PFP was defined by presence of 3 or more criteria: physical inactivity, self-reported exhaustion, physical weakness, slow mobility, and significant weight loss. Conditional logistic regression, adjusted for confounders, evaluated associations between olfactory subdomains and frailty.

Results:
Mean age was 83.1 (SD 4.9). 60% were female, 87.8% were white, 35% had smoking history, and 53.3% were married. TDI scores were significantly lower in the frail group (21.74 [SD 6.63] vs. 32.24 [SD 5.70], $p < 0.001$). Adjusted regressions showed that 1-point decreases in OT (OR = 2.21, 95%CI [1.22, 3.98]), OD (2.19 [1.32, 3.65]), OI (2.29 [1.19, 4.39]), and TDI (1.54 [1.14, 2.08]) were each significantly associated with increased odds of PFP.

Conclusion:
There is a robust association between all olfactory subdomain scores and frailty, suggesting they may be valuable markers of frailty. Future aging studies should measure olfaction and frailty longitudinally to assess for predictive relationships.

2:24 pm – 2:30 pm
**Area deprivation index and CRS**
Amarbir Gill, MD
Benton Tullis
Vivek Pandrangi, MD
Jorge Gutierrez, BA
Jess Mace, MPH CCRP
Vijay Ramakrishnan, MD, FARS
Daniel Beswick, MD, FARS
Zachary Soler, MD, FARS
Jeremiah Alt, MD, PhD, FARS
Conner Massey, MD
Timothy Smith, MD, MPH, FARS

Objective:
Socioeconomic status (SES) is linked to health outcomes but not well-studied in patients with chronic rhinosinusitis (CRS). The area deprivation index (ADI) is a comprehensive measure of geographic SES that ranks neighborhood disadvantage. This study used ADI to understand the impact of neighborhood disadvantage on CRS treatment outcomes.

Methods:
A total of 642 study participants with CRS were prospectively enrolled and self-selected endoscopic sinus surgery (ESS) or continued appropriate medical therapy (CAMT). The 22-item SinoNasal Outcome Test (SNOT-22) and Medical Outcomes Study Questionnaire Short-Form 6-D (SF-6D) health utility value scores were recorded pre- and post-treatment. Using residence zip codes, national ADI scores were retrospectively assigned to patients. Spearman's correlation coefficients (Rs) and Cramer's V effect size ($\varphi c$) with 95% confidence intervals (CI) were calculated.

Results:
A history of endoscopic sinus surgery (ESS) was associated with significantly worse ADI scores compared to no history of ESS ($\varphi c$= 0.18; 95% CI: 0.10, 0.25; $p<0.001$). Baseline SNOT-22 (Rs= 0.14; 95% CI: 0.06, 0.22; $p<0.001$) and SF-6D values (Rs= -0.20; 95% CI: -0.27, -0.12; $p<0.001$) were significantly, negatively correlated with national ADI rank. No significant correlations between ADI and within-subject improvement, or achievement of >1 minimal clinically important difference in SNOT-22 or SF-6D scores were noted.

Conclusion:
Geographic socioeconomic deprivation was associated with worse baseline disease severity and history of prior surgical intervention but did not correlate with improvement in disease-specific outcomes. The impact of socioeconomic deprivation on outcomes in CRS requires further investigation.

2:31 pm – 2:37 pm
**Assessing the efficacy of shared decision-making in the management of chronic rhinosinusitis**
Vivienne Li, BA
Andrew Yousef, MD
Michael Oca, BS
Divya Prajapati, MD
Leslie Gomez, MSN, FNP-C
Adam DeConde, MD
Carol Yan, MD
UC San Diego School of Medicine

Background:
Shared decision-making (SDM) uses evidence-based guidelines and patient preferences to develop optimal treatment plans. We explored the role of SDM with the use of a decision aid (DA) in the management of CRS.

Methods:
A randomized, controlled trial enrolled medically refractory CRS patients counseled on sinus surgery (ESS) and recruited two groups: no intervention vs. intervention with a DA. All participants were given a multiple-choice questionnaire gauging CRS knowledge (MCQ) and the validated Decision Conflict Scale (DCS). The intervention group reviewed a DA and repeated the MCQ and DCS. Demographic, clinical, and socioeconomic data were collected. A paired t-test was used for intergroup comparisons and an ordered logistic regression compared the intervention group pre- and post-DA.

Results:
Forty-one patients were recruited with 20 randomized to the intervention group and 21 to no intervention. There were no demographic differences between the two groups. Mean SNOT-22 score was 49.5 with no intergroup difference (p=0.40). The intervention cohort demonstrated improvement in their understanding of post-operative care after viewing the DA (p=0.025). After intervention, patients expressed less uncertainty with their decision (5 vs 25%; p=0.03) and were more likely to prefer surgery over other treatments (55 vs 30%; p=0.03). They were also more likely to strongly agree that they knew the risks (65 vs 45%; p=0.02) and benefits of surgery (65 vs 50%; p=0.02). There was no difference in overall DCS scores pre- and post-intervention (14.1 vs 13.1; p=0.38).

Conclusion:
SDM with DA may improve patient knowledge and confidence in electing ESS for CRS. Larger studies will help determine how SDM can optimize CRS management.

2:38 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeting Discussions and Debates: De-escalation of Therapies in CRS**
Moderator: Vijay Ramakrishnan, MD, FARS
Panelists: Elisa Illing, MD, FARS; Anju Peters, MD

*Moderators: Kibwei McKinney, MD; Charles Tong, MD, FARS*

3:31 pm – 3:37 pm
**University of Washington quality of life subdomain outcomes after treatment in sinonasal malignancy**
Sabrina Maoz, PhD
Autreen Golzar
Eric Wang, MD, FARS
Edward Kuan, MD, FARS
Nithin D. Adappa, MD, FARS
Mathew Geltzeiler, MD, FARS
Anne Getz, MD, FARS
Ian Humphreys, DO, FARS
Christopher Le, MD, FARS
Carlos Pinheiro Neto
Daniel Beswick, MD, FARS

Purpose:
Sinonasal malignancy (SNM) is a rare disease, presenting at late stage, with significant impact on quality of life (QOL). Extending recent work that found global QOL improves post-treatment for patients with SNM, this study examined drivers of subdomains of the University of Washington QOL (UWQOL) instrument.

Methods:
276 patients with SNM were analyzed from a prospective, multi-institutional study. Multivariable models evaluated factors influencing the 9 UWQOL subdomains from baseline to 5-years post-treatment.

Results:
Overall, pain, appearance, swallow, chew, speech, and shoulder subdomains were drivers of worse QOL. Pain, activity, recreation, taste, saliva, mood, and anxiety subdomains improved by 1-year. Multivariable models found endoscopic resection predicted improved pain (vs. non-surgical treatment; CI 0.1, 15.3; p=0.02), appearance (vs. open, vs. combined; CI 18.7, 35.3; p<0.001), and chewing (vs. open resection; CI 0.3, 18.7; p=0.05). Pterygopalatine fossa involvement predicted worse swallow (CI -10.4, -2.0; p=0.01) and pain (CI -16.7, -3.8; p<0.001). Neck dissection predicted worse swallow (CI -14.9, -3.0; p<0.001), taste (CI -31.6, -1.7; p=0.03), and saliva (CI -28.4, -8.6; p<0.001). Maxillary primary site predicted worse chewing (CI 9.6, 32.6; p<0.001) and speech (CI -21.8, -5.4; p<0.001) relative to nasal and ethmoid primary sites. T stage predicted worse anxiety (CI -12.9, -2.0; p=0.03) but no other subdomain.

Conclusions:
Surgical approach, neck management, extent and origin of disease impact precise UWQOL symptom areas. Endoscopic resection predicted better pain, appearance, and chewing compared to open. These results can improve specificity in counselling patients on SNM and its treatment.

3:38 pm – 3:44 pm

**Are routine lumbar drains necessary after endoscopic resection of anterior skull base tumors?**

Jacob Harris, BA
David Lerner, MD
Iulia Tapescu;
Alan Workman, MD
Jennifer Douglas, MD
Michael A.Kohanski, MD
Phillip Storm
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS

Background:
The expanded endonasal approach (EEA) is an endoscopic technique for accessing anterior skull base pathology. EEAs are traditionally associated with a high rate of post-operative cerebrospinal fluid (CSF) leak, leading many to advocate for routine lumbar drain (LD) placement for post-operative CSF diversion. Here we report outcomes for anterior skull base reconstruction without LD placement after an EEA exposing the third ventricle.

Methods:
A single-health system retrospective chart review was conducted evaluating consecutive pediatric and adult patients undergoing an EEA for resection of anterior skull base pathology exposing the third ventricle from 2015-2023.

Results:
77 patients underwent a total of 81 EEAs including 4 revision resections. Patients were predominantly female (n=57, 70.4%) with an average age of 45.9 years (range 11 months-84 years). Tumors included meningiomas (n=39, 48.2%) craniopharyngiomas (n=39, 48.2%), as well as three other pathologies. No lumbar drains were placed perioperatively and there was an 100% intra-operative high-flow CSF leak rate. Skull base reconstruction was performed using a pedicled nasoseptal flap (NSF) in all cases (n=81, 100%), tensor fascia lata graft in 75 cases (92.6%) and fat graft in 71 cases (87.7%). The post-operative CSF leak rate was 8.6% (n=7).

Conclusion:
In our review of both pediatric and adult patients undergoing skull base reconstruction following EEA exposing the third ventricle, we found a low rate of post-operative CSF leak without lumbar drain placement. These results suggest that skull base reconstruction, even with an exposed third ventricle, can be successfully performed with multilayered reconstruction without need for routine CSF diversion.

3:45 pm – 3:51 pm

**Longer-term surveillance imaging and endoscopy needed in majority of sinonasal malignancy recurrence**

Alan Workman, MD MTR
Jadyn Wilensky
Kaska Kwiecien
David Lerner, MD
Jennifer Douglas, MD
Michael A. Kohanski, MD
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS
University of Pennsylvania Perelman School of Medicine

Background:
Sinonasal malignancy surveillance paradigms are often based on Head & Neck National Comprehensive Cancer Network (NCCN) guidelines, which do not recommend standard surveillance imaging beyond 6 months without concerning symptomatology or examination.

Methods:
This is a retrospective analysis of all patients who underwent resection of sinonasal malignancy at a tertiary care center over a twenty-year period from 2000-2020, with a surveillance period demonstrating recurrence.

Results:
52 patients with sinonasal malignancy recurrence were included, with an average time to recurrence of 30.9 months and follow up period of over 5 years. Recurrence was diagnosed by routine imaging or endoscopy in asymptomatic patients in a majority (60%) of cases, while the remaining minority of diagnoses followed new symptomatology. Pathologies varied, including 16 SCC, 9 adenocarcinoma, 9 adenoid cystic carcinoma, 6 SNUC/SNEC, 4 melanoma, 3 sarcoma, 4 olfactory neuroblastoma, and 1 clear cell carcinoma. Asymptomatic recurrence was associated with perineural spread of tumor at initial resection (p=0.025), but not with age (p=0.85) or stage at diagnosis (p=0.68). Expectedly, PET/CT more often detected regional or distant recurrence, while structural imaging (CT/MRI) demonstrated more frequent detection of recurrence in those with perineural spread of tumor (p=0.01).

Conclusions:
Our findings support high rates of asymptomatic recurrence in sinonasal malignancy, with the majority of recurrences diagnosed by routine endoscopy or imaging. Tailored and extended surveillance guidelines are necessary relative to those utilized in head & neck cancer overall, and especially appropriate when features such as perineural spread are present.

3:52 pm – 3:58 pm
**The role of induction chemotherapy for orbital invasion in sinonasal malignancies**
Anthony Tang, BS
Garret Choby, MD, FARS
Eric Wang, MD, FARS
Carl Snyderman, MD
Paul Gardner, Dr.
Georgios Zenonos, Dr.
Tonya Stefko, Dr.
Mathew Geltzeiler, MD, FARS
Dan Zandberg, Dr.
Micah Harris Dr.
Michael Calcaterra, Mr.
University of Pittsburgh School of Medicine

Background:
For sinonasal malignancies (SNM) with orbital invasion, induction chemotherapy (IC) is an alternative to orbital exenteration (OE) that may allow for orbit-preserving surgery (OPS) with acceptable oncologic outcomes. This systematic review synthesizes the published data on outcomes after IC for SNM patients with orbital invasion.

Methods:
The study protocol was designed in accordance with PRISMA guidelines. Comprehensive searches of the Embase, Cochrane, Scopus, and Web of Science databases from inception to July 17, 2023 were conducted.

Results:
23 studies encompassing 336 patients reported outcomes in SNM patients with orbital invasion treated with IC; the majority were squamous cell carcinomas (SCC) (45.8%) or sinonasal undifferentiated carcinomas (29.2%). In the cohort, 12.5% underwent OE after IC. Amongst studies specifically reporting patients who would have undergone OE based on presenting tumor, 47.8% (19/39 patients) were successfully downgraded from OE to OPS following IC.
Two studies included survival data for a total of 131 SNM patients with orbital invasion that received IC with a 5-year overall survival (OS) of 44.2-54.5% and 5-year disease-free survival (DFS) of 58.5-63.1%. Moreover, assessing SNM IC response rate (complete or partial reduction in tumor volume) for patients regardless of orbital invasion, the overall response rate to IC was 69.6% (25 studies; 434 patients). Within a cohort of SCC patients undergoing IC (123 patients), patients with at least a partial response to IC had better OS and DFS than those with disease progression during IC.

Conclusions:
IC may allow for orbital preservation in locally advanced SNM with orbital involvement. Response to IC may predict subsequent OS and DFS.

3:59 pm – 4:05 pm
**Outcomes of endoscopic endonasal resection for pediatric craniopharyngiomas**
David Lerner, MD
Sanjena Venkatesh
Alan Workman, MD
Dominick Rich
Sarah Barnett
Jennifer Douglas, MD
Michael A. Kohanski, MD
Phillip Storm
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS
University of Pennsylvania

Objective:
There has been a shift in pediatric craniopharyngioma management from resection via an open approach to an expanded endonasal approach (EEA) to optimize rates of gross total resection (GTR) while minimizing surgical morbidity. We report our outcomes in utilizing an EEA with intent for GTR among pediatric patients with craniopharyngioma.

Methods:
A retrospective review of all pediatric patients undergoing an EEA for craniopharyngioma with intent for GTR between 2011 and 2023 at our institution was performed.

Results:
Fifty-three patients who underwent 56 procedures were included. Thirty-eight patients were male (70.7%) with a mean age of 9.04 years (range 1-19). GTR was achieved in 82.1% of cases. Skull base reconstruction was accomplished with a vascularized nasoseptal flap (NSF) in 54 cases (96.4%), fat graft in 55 cases (98.2%), and fascia lata graft in 53 cases (94.6%). Post-operatively, three patients (5.4%) each had a cerebrovascular ischemic event or a cerebrospinal fluid (CSF) leak requiring return to the operating room for revision reconstruction. Eight patients were noted to have residual or recurrent disease at an average of 13.7 months following surgery. Of these, 6 underwent revision surgery and 2 underwent adjuvant radiation therapy.

Conclusions:
Our work represents the largest review of pediatric craniopharyngioma patients undergoing an EEA with intent for GTR. We found that the EEA is associated with a high rate of GTR and a low rate of post-operative CSF leak and stroke. Successful skull base repair was accomplished with a multilayered reconstruction. Our findings provide additional evidence that the EEA is safe and effective for craniopharyngioma resection within the pediatric population.

4:05 pm – 4:11 pm
**Q&A**

4:12 pm – 4:55 pm
**Panel: How Do We Measure Success in Endoscopic Skull Base Surgery**
Moderator: Gurston Nyquist, MD, FARS
Panelists: Odelia Cooper, MD; Ashleigh Halderman, MD, FARS; Stephen Magill, MD; Chirag Patel, MD, FARS

4:55 pm – 5:00 pm
**Q&A**

5:00 pm – 5:30 pm
**ARS Business Meeting**

5:30 pm – 7:00 pm
**ARS President's Reception**
Plaza Ballroom

## Wednesday, May 15, 2024
## Afternoon Concurrent Session
## Grand Hall MNL
## 1:00 pm – 5:00 pm CST

*Moderators: Nicholas Rowan, MD; Stephanie Smith, MD*

1:00 pm – 1:06 pm
**Inhalational exposure history is associated with differential sinonasal gene expression profiles**
Cameron Worden, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
Cristine Klatt-Cromwell, MD
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
Meghan Rebuli, Assistant Professor
Ilona Jaspers, Professor
University of North Carolina Hospitals

Background:
There is emerging evidence that inhalational exposures (IE) play a role in chronic rhinosinusitis (CRS) disease burden. However, it is unclear if an IE history is associated with transcriptome changes in sinonasal tissue and if these changes correlate with clinical outcomes.

Methods:
CRS patients set to undergo endoscopic sinus surgery (ESS) completed an IE questionnaire preoperatively. Exposure scores to vapors/mists/gases, dusts/fibers, and smoke/fumes subgroups and a combined score were determined and patients were categorized as high or low based on the group median. RNA sequencing was performed on collected ethmoid bulla tissue. Preoperative clinical outcomes assessed included RSDI and Lund-Kennedy scoring, number of prior oral steroids and ESS, and history of asthma or allergy.

Results:
27 patients (18 CRSwNP, 9 CRSsNP) were included. CRSwNP patients had higher combined (mean: 59 vs 26, p=0.008) and dusts/fibers (mean: 23 vs 5, p=0.002) exposure scores than CRSsNP patients. Patients with high scores in all 3 exposure subgroups (n=7) had higher mean RSDI scores (31 vs 11, p=0.04), a greater likelihood of asthma diagnosis (p=0.03), and enrichment of gene expression changes associated with pro-inflammatory pathways and phagosome formation. Smoke/fumes exerted the greatest effect among exposures with 1126 differentially expressed genes (5% false discovery rate).

Conclusions:
Patients with a greater self-reported IE history demonstrated pro-inflammatory transcriptome changes in their sinonasal tissue and clinically had worse CRS-specific quality of life and a higher likelihood of lower airway disease. Development and implementation of an IE history assessment may improve CRS endotyping and therapeutic approaches.

1:07 pm – 1:13 pm
**Arachidonic acid metabolites in nasal mucus distinguish chronic rhinosinusitis from non-sinusitis**
Marisa Griesel
Kathleen Bartemes, Research Associate
Danielle Hunter, Research Technologist
Steven Voss
Santiago Romero Brufau
Rohit Divekar, Consultant - Allergic Diseases
Garret Choby, MD, FARS
Carlos Pinheiro Neto, Senior Associate Consultant
John Hagan
Erin O'Brien, MD, FARS
Mayo Clinic

Introduction:
Little is known about the metabolomic changes associated with chronic rhinosinusitis (CRS), particularly in nasal secretions. We performed a pilot study using untargeted metabolomics to assess whether CRS-associated metabolomic changes are detectable in nasal mucus.

Methods:
Nasal mucus was collected from the middle meatus of 5 control and 10 CRS patients. Metabolites were detected via liquid chromatography-mass spectroscopy. After preprocessing, non-significant metabolites were identified by the Hochberg p value adjustment (0.05 cutoff) and removed. Log-transformation, auto-scaling, hierarchical clustering (HC) and principal component analysis (PCA) were performed with MetaboAnalyst 5.0. Exogenous metabolites were manually removed.

Results:
We identified 20 significant endogenous metabolites that separated control and CRS samples by both HC and PCA. Ten of the metabolites are part of the arachidonic acid pathway, including 4 involved in resolvin generation, 5 in leukotriene generation and 1 in prostaglandin generation. The most significant metabolite in each pathway was 8-oxo-resolvin D1 (false discovery rate (FDR)=0.00271, disease vs. control fold change (FC)=0.109), 8,15-Leukotriene B4 (FDR=0.00142, FC=0.000368) and 20-hydroxy-PGE2- (FDR=0.00271, FC=0.0587), respectively.

Conclusion:
Metabolomic changes associated with CRS were detectable in nasal mucus via untargeted metabolomics analysis of nasal mucus. Consistent with current understanding, nasal mucus metabolomics implicated leukotriene, prostaglandin and resolvin pathways in CRS. Further studies are required to distinguish between CRS subtypes and confirm the metabolomic changes associated with CRS.

1:14 pm – 1:20 pm
**Particulate matter may increase polyp risk**
Rory Lubner, MD
Mason Krysinski, MD
Rakesh Chandra, MD, FARS
Justin Turner, MD, PhD, FARS
Naweed Chowdhury, MD, MPH
Vanderbilt University Medical Center

Background:
Particulate matter □2.5 μm in diameter (PM2.5) and its role in chronic rhinosinusitis (CRS) pathogenesis has gained heightened attention. We demonstrated that PM2.5 exposure may bias the nasal mucosa in CRS towards a type-2 inflammatory pathway. However, there is limited data comparing cytokine changes in CRS sinonasal tissue to non-CRS patients as it relates to PM2.5 exposure. We hypothesized that long-term exposure preferentially increases the risk of manifesting CRS with nasal polyposis (CRSwNP).

Methods:
We performed a cross-sectional analysis of 376 patients (308 CRS, 68 controls) undergoing endoscopic sinus or skull base surgery. A spatiotemporal machine learning model estimated daily PM2.5 levels for one year prior to each patient's surgery date. Cytokines were quantified using a multiplex flow cytometric bead assay and compared to estimated PM2.5 exposure using Spearman correlation and multivariate regression. Patients with high and low 12-month PM2.5 exposures were matched across age, sex, income, and rurality using a nearest-neighbor algorithm. Multivariate adjusted logistic regression was used to estimate the odds of CRS based on PM2.5 exposure.

Results:
Reduced IL-10 levels were associated with higher PM2.5 exposures in control patients (β =-0.735, p=0.0196). In matched logistic regression analysis, high PM2.5 exposure was an independent predictor of CRSwNP (β = 2.42, OR: 11.13, p<0.0001) after adjustment for age, sex, income, rurality, and comorbid asthma/allergic rhinitis. A similar relationship was not identified for CRSsNP or CRS generally.

Conclusions:
PM2.5 exposure is associated with differential cytokine profiles in control patients compared to CRS and may increase odds of CRSwNP development.

1:21 pm – 1:27 pm
**Purine metabolism is upregulated in chronic rhinosinusitis: Implications for injury**
Maria Villanueva, BS
Jennifer Mulligan, PhD
Jeb Justice, MD, FARS
Brian Lobo, MD, FARS
Carl Atkinson, Professor
University of Florida

Introduction:
Extensive studies have demonstrated that sinonasal epithelial cells (HSNECs) from patients with chronic rhinosinusitis with nasal polyps (CRSwNP) are intrinsically pro-inflammatory. The mechanisms underlying this inflammatory state are poorly understood. Recent studies in immune cells have implicated changes in cellular metabolic activity in the regulation of cellular inflammation. Here we investigated the metabolomic pathways present in CRSwNP HSNECs.

Methods:
Primary HSNECs were cultured at the air-liquid interface from control subjects (n=8) or those with CRSwNP (n=12) and submitted for metabolomic analysis. Nontargeted global metabolomic profiling was conducted utilizing liquid chromatography coupled with mass spectrometer. Metabolites were identified by their accurate molecular weight, mass-to-charge ratio, retention time, and comparison to library entities of purified known standards in the Human Metabolome Database.

Results:
31 significantly different metabolites were identified in CRSwNP HSNECs vs control using raw p value analysis. Based on levels of compound confidence, in which 7 were level 1, analysis demonstrated distinct profiles in CRSwNP. Of these we found 4 elevated and 4 downregulated metabolites. Purine metabolites were over-produced in CRSwNP, and citrate cycle and fatty acid metabolites were reduced, as compared to control SNECs.

Conclusion:
CRSwNP HSNECs exhibit a metabolomic signature that is unique and significantly different from controls. Overexpression of purine metabolites can promote inflammation, mTOR signaling, and cell survival, factors known to contribute to CRSwNP. Thus, further metabolomic studies are warranted to identify candidates for therapeutic intervention.

1:28 pm – 1:34 pm
**Sinonasal transcriptome study of chronic rhinosinusitis with and without asthma**
Nitish Kumar, MBBS, MS
Devyani Lal, MD, FARS
Chantal McCabe, Bioinformatician
Tao Ma
Mayo Clinic

Background/Aim:
High concordance of nasal and airway transcriptome has been identified in asthma. However, the interaction of chronic rhinosinusitis (CRS) and asthma in the nasal transcriptome is not well known. This study compared the sinonasal transcriptome of CRS with asthma (CRSwA), CRS without asthma (CRSsA) and control subjects.

Methods:
RNA sequencing was conducted on 14 sinonasal tissue samples: 4 CRSwA, 6 CRSsA and 4 controls. Differentially expressed genes (DEG) between groups were reported along with their magnitude of change (log2 scale), and level of significance (False Discovery Rate <5%) using bioinformatics package edgeR 2.6.2.8. Canonical pathway analysis was performed using Ingenuity Pathway Analysis (IPA) software with significance at p-value <5%.

Results:
We identified 358 DEGs between CRSwA vs controls and 1080 DEGs in CRSsA vs. controls. Of these, 197 genes were differentially expressed in both CRSwA and CRSsA vs. controls. There were 161 DEGs that were specific to CRSsA vs control; IPA analysis showed them to be related to immune and homeostatic signaling pathways (activin inhibition, glucocorticoid receptor, TNF-related apoptosis-inducing ligand, JAK kinase) and cell regulation (cell surface interactions at vascular wall, transcriptional regulation of stem cells) amongst others. Although 393 DEGs were identified in CRSwA vs CRSsA, no clear separation was identified on principal component analysis.

Conclusion:
Sinonasal tissue of CRSwA and CRSsA has similar transcriptomic profile (likely from dominant type 2 inflammation). However, distinct genes involved in signaling and regulation of immune and homeostatic mechanisms were differentially expressed in CRSwA sinonasal tissue only when compared to cont

1:35 pm – 1:41 pm
**Mediation of LPS-induced inflammation with pro-resolving treatment in human nasal polyp tissue**
Vijay Ramakrishnan, MD, FARS
Peyton Robinson
Cristina Delgado, Medical Student
Khalid Khan, Postdoctoral Fellow
Indiana University School of Medicine

Introduction:
Chronic Rhinosinusitis (CRS) arises from a temporal imbalance of pro-inflammatory, anti-inflammatory, and pro-resolving activities. Chronic pathophysiology may be secondary to dysregulation of the NF-kB pathway. Specialized pro-resolving mediators (SPMs) have recently been shown to provide balance in healthy nasal mucosal function, reducing NF-kB activity. This study investigates the mechanisms whereby SPMs may serve a pro-resolving role in CRS with nasal polyps.

Methods:
CRS polyp tissue was collected from patients during endoscopic sinus surgery (N=3). Tissues underwent 24-hour exposure to lipopolysaccharide (LPS), with or without SPM treatment (lipoxin A4 (LXA4); resolvin D2 (RvD2)) at physiological concentrations, or control. PCR microarray, qPCR, and multiplex ELISA were used to evaluate expression of inflammatory molecules and NF-kB-related genes, including MYD88, CXCL-1, and G-CSF.

Results:
In ex vivo polyp tissue, MYD88, CXCL1, and G-CSF were markedly increased with LPS exposure. Their response was significantly abrogated by RvD2 treatment and to a lesser degree, by LXA4. qPCR validation confirmed that G-CSF was downregulated when exposed to LPS+RvD2 (compared to when exposed only to LPS). There was an >80 fold difference (LPS vs. LPS+RvD2 normalized to GADPH ($p = 0.009$) & B-actin ($p = 0.010$); when compared to control.

Conclusion:
Here we report that G-CSF--a stimulator of granulocyte maturation—and potentially other NF-kB target genes, may be modulated by SPMs. SPMs and active inflammatory resolution is a novel approach to the management of inflammation in CRS.

1:42 pm – 1:48 pm
**Machine learning to identify nasal mucus biomarkers associated with olfactory loss in patient**
Jennifer Mulligan, PhD
Jason Corey Brunson
Anil Patel
Maria Villanova, Lab Technician
Jeb Justice, MD, FARS
Brian Lobo, MD, FARS
Carl Atkinson, Professor
University of Florida

Background:
The mechanisms driving CRSwNP-related olfactory loss remain largely unknown. Here we sought to identify novel modulators of olfactory function via the examination of nasal mucus biomarkers using a 71-cytokine plex analyzed via machine learning models.

Methods:
Olfactory testing was performed via 40-question smell identify test (UPSIT). During endoscopic sinus surgery, sponges were placed in the middle meatus of control subjects (n=14) or individuals with CRSwNP (n=15). Samples were sent to Eve Technologies to conduct the 71-Plex cytokine/ chemokine Array. Results underwent analysis with statistical and machine learning models to assess whether protein concentrations were predictive of diagnosis and olfactory function.

Results:
Preliminary analysis found several cytokines to be significantly different between CRSwNP and control groups: Eotaxin, Eotaxin-3, FGF, FLT-3L, Fractalkine, IL-5, IL-17A, IL 18, EGF, G CSF, IL-1β, MDC, MIP-1β, RANTES. Preliminary modeling suggests that IL 21, I-309, TSLP, and IL-27 concentrations are associated with more severe olfactory dysfunction. IL-21 and TSLP positively associated with dysfunction in the control group, IL-21 to a lesser extent and TSLP to a greater extent. IL-27 was negatively associated with olfactory loss.

Conclusion:
Using a 71-cytokine/ chemokine plex analyzed via machine learning, we identified potentially novel roles for IL 21, IL-27, I-309, and TSLP as modulators of olfactory function. Use of machine learning for the analysis of nasal mucus cytokines, may serve as powerful tool to analyze multi-plex immune mediator data.

1:49 pm – 1:55 pm
**Q&A**

*Moderators: Do-Yeon Cho, MD; Devyani Lal, MD, FARS*

1:56 pm – 2:02 pm
**Impact of LYR-220 on ethmoid opacification and CRS symptoms in the BEACON study**
Brent Senior, MD, FARS
Vineeta Belanger, PhD
Amber Luong, MD, PhD, FARS
Zachary Soler, MD, FARS
Robert Naclerio, MD
Robert Kern, MD, FARS
Misun Lee
Richard Nieman

Background:
LYR-220 is an investigational product being developed to provide up to 24 weeks of corticosteroid treatment for symptomatic CRS patients with prior ethmoidectomy. Initial results from the Phase 2 BEACON study showed that LYR-220 was well tolerated and demonstrated clinically meaningful CRS symptom improvement at week 24. This presentation reports objective radiological data from the BEACON study evaluating change in ethmoid opacification volume and additional CRS symptom data out to week 28.

Methods:
CRS subjects with prior bilateral ethmoidectomy (N=42) were enrolled in the BEACON study and randomized 1:1 to receive LYR-220 or sham-procedure. Change from baseline (CFBL) in bilateral percent ethmoid opacification at week 25 was assessed using 3D volumetric analysis of CT scans. Changes in SNOT-22 and composite score of the 3 CRS cardinal symptoms (3CS; nasal blockage, nasal discharge and facial pain) were evaluated through week 28 (4 weeks post-end of treatment).

Results:
LYR-220 significantly improved ethmoid opacification vs sham at week 25 (Mean CFBL (percentage points): -6.91 in LYR-220 vs. 1.23 in sham; $p<0.05$). Clinically significant improvements in SNOT-22 total scores were observed in the LYR-220 group vs sham at week 2 (-9.0; $p<0.05$) and were sustained throughout the study, including at week 28 (-17.6; $p<0.01$). LYR-220 demonstrated improved 3CS scores vs sham at week 4 (-0.87; $p<0.05$) and week 24 (-1.5; $p<0.05$); and while not statistically significant [in this small sample], improvement continued over sham at week 28 (-1.28; $p=0.063$).

Conclusion:
In the BEACON study, LYR-220 achieved clinically meaningful and statistically significant improvements in key symptomatic and objective CRS efficacy endpoints.

2:03 pm – 2:09 pm

**EDS-FLU for CRS: Prior ESS subgroup analysis**

Sarah Wise, MD, FARS
Nithin D. Adappa, MD, FARS
Rakesh Chandra, MD, FARS
Greg E. Davis, MD, FARS
Mahbobeh Mahdavinia, MD
Ramy Mahmoud, MD, MPH
John Messina, PharmD
Randall A. Ow, MD, FARS
James N. Palmer, MD, FARS
Zara Patel, MD, FARS
Anju T. Peters, MD
Harry Sacks, MD
Rodney J. Schlosser, MD, FARS
Raj Sindwani, MD, FARS
Zachary M. Soler, MD, FARS
Andrew A. White, MD

Introduction:
The inability for topical medications to reach sinus cavities is considered a potential reason for lack of efficacy in CRS. Endoscopic sinus surgery (ESS) increases delivery of medications to the sinus cavities. The Exhalation Delivery System™ with Fluticasone (EDS-FLU; XHANCE®) uses a unique device for intranasal corticosteroid deposition to sinus drainage pathways in unoperated sinuses, and into the sinuses post ESS. Phase 3, 24-week, randomized trials (ReOpen1/2) evaluated EDS-FLU vs EDS-placebo twice daily in patients with CRS, stratified by surgical status.

Methods:
Pooled data from ReOpen1/2 were analyzed by surgery subgroups (e.g., surgery naïve vs previous ESS) for the co-primary endpoints combined symptom score (CSS, week 4) and average of percentages of opacified volume (APOV) of ethmoid/maxillary sinuses on CT (week 24) as well as congestion score (week 4) and Sinonasal Outcomes Test 22 (SNOT-22) total score (week 24). All data reported are least-square mean change.

Results:
Baseline scores suggested moderate-severe disease: mean CSS=6.0; APOV=62.0%. EDS-FLU had significant effects compared to placebo (nominal $p<.05$) on each of the following measures regardless of surgical status (EDS-placebo vs EDS-FLU): CSS, previous ESS, -0.70 vs -1.87; surgery naïve, -0.62 vs -1.42; APOV, previous ESS, -0.95 vs -7.03; surgery naïve, -0.30 vs -4.22; congestion, previous ESS, -0.24 vs -0.69; surgery naïve, -0.24 vs -0.59; and SNOT-22, previous ESS, -10.72 vs -18.74; surgery naïve, -7.56 vs -18.30.

Conclusion:
EDS-FLU improved symptoms and sinus opacification in patients with CRS, including both those who had sinus surgery and surgery-naïve patients, suggesting a role for EDS-FLU prior to considering surgery.

2:10 pm – 2:16 pm

**Topical steroids for CRSsNP: A systematic review and meta-analysis**

Akash Bhat, BS
Luke Heiland
Shaun Nguyen, Physician
Vinay Rathi, Physician
Rodney Schlosser, MD, FARS
Zachary Soler, MD, FARS
Medical University of South Carolina

Background:
Topical steroid treatment is commonly recommended as initial treatment for chronic rhinosinusitis without nasal polyposis (CRSsNP). However, the evidence base supporting this treatment is conflicting and differences may exist across delivery systems. An updated synthesis of the literature would be useful to guide clinical treatment, particularly considering new clinical trial data.

Methods:
Cochrane Library, CINAHL, PubMed, and Scopus databases were queried for randomized control trials evaluating the efficacy of topical steroid therapy for CRSsNP, including topical sprays and the exhalation delivery system (EDS) modalities. Outcome measures included total symptoms scores (TSS), subjective response to treatment (SRT), and quality of life (QoL).

Results:
Nine studies (N=721 patients) were included for meta-analysis, with a mean age of 47.5 years (range: 18-80 yrs). TSS improved significantly across all studies with topical steroids compared to placebo (Δ-0.37; 95% CI: -0.55 to -0.19; P=0.0001). However, when analyzing a subgroup of patients without allergy, only EDS improved significantly (Δ-0.29; 95% CI: -0.58 to -0.01; P=0.04), whereas topical spray did not show benefit (Δ-0.02; 95% CI: -0.50 to 0.46; P=0.93). SRT also improved significantly across all studies with topical steroids compared to placebo, but again this difference was limited to EDS delivery (OR: 3.37; 95% CI: 1.89 to 6.00; P<0.0001). Only EDS trials evaluated sinus-specific QoL with both studies reporting significant improvement.

Conclusions:
There is weak evidence for the efficacy of topical steroid sprays for CRSsNP, particularly in patients without allergy. The strongest data supports the EDS modality, including TSS, SRT, and QoL measures.

2:17 pm – 2:23 pm
**A cost utility analysis for the management of acute exacerbations of chronic rhinosinusitis**
Matthew Chu, MD
Katie Phillips, MD
Ahmad Sedaghat, MD, FARS
George Scangas, MD
Jack Garcia

Background:
The management of acute exacerbations of chronic rhinosinusitis (AECRS) is understudied and how to most effectively manage the initial patient call regarding their AECRS has not been previously evaluated. The aim of this study is to determine the most cost-effective strategy for the initial management of AECRS.

Methods:
The study design consisted of a decision-tree economic model comparing three different initial strategies for managing a patient perceived AECRS: observation, upfront antibiotics, or clinic visit with diagnostic nasal endoscopy (DNE). The primary study outcome was the disease burden of a single AECRS which was determined by the health utility value and the duration of symptoms. Strategies with an incremental cost-effectiveness ratio < $50,000/ quality-adjusted life year (QALY) or equivalently $137/quality-adjusted life day (QALD) were considered to represent reasonable value for money.

Results:
Observation was the most cost-effective strategy at a willingness to pay of $137 per QALD. One-way sensitivity analysis demonstrated that observation was more effective than upfront antibiotics when the probability of bacterial infection as the cause of patient perceived AECRS was < 15.5%. Upfront antibiotics was more cost-effective than observation when the probability of bacterial infection exceeded 40.1%. Clinic visit with DNE was the most effective strategy, but it was not considered cost-effective.

Conclusion:
Observation is the most cost-effective strategy for the initial management of patient perceived AECRS when there is a low likelihood of bacterial infection. When the probability of bacterial etiology of AECRS exceeds 40.1%, upfront antibiotics proved to be the most cost-effective strategy.

2:24 pm – 2:30 pm
**Incidence of infections during AECRS in CRS adults**
Nirushan Narendran, MS
Eugene Chang, MD, FARS
University of Arizona

Most acute exacerbations in CRS (AECRS) are thought to be secondary to rhinovirus (RV) infections that proceed to bacterial infections. AECRS episodes result in significant health care costs, yet the pathophysiology of disease is not well characterized. To prospectively study CRS adults both at baseline and during AECRS episodes over one year to characterize the pathophysiology of the disease. We enrolled 110 CRS adults and assessed their baseline through subjective questionnaires (SNOT-22) and endoscopic scores. Patients were contacted every 2 weeks and if they scored greater than 1 on the Wisconsin Upper Respiratory Symptom Survey (WURSS), they were evaluated for an AECRS episode. Nasal swabs were collected for presence of RV and if patients exhibited purulent mucus, a bacterial swab was cultured. 40% of CRS patients experienced an AECRS with a WURSS score greater than or equal to 1. CRS patients with AECRS had higher SNOT-22 (51.0±15.4, p<0.001), mucus (2.3±1.1, p<0.001) and edema (1.4±0.5, p<0.001) scores compared to their baseline visits. Half of the patients with AECRS had positive bacterial infections and had higher SNOT-22 (57.6±17.2, p=0.003) and mucus (2.0±0.6 p< 0.001) scores compared to patients without a bacterial sinus infection. The most common bacteria cultured were S. aureus and P. aeruginosa. Patients with a comorbid rhinovirus (RV) infection and bacterial infections had 1.5 times higher scores of SNOT-22 (70.4±11.5; p=0.049) and 1.7 times higher edema (2.2±0.4, p=0.002) scores relative to patients with just a bacterial infection. We report the first prospective study and CRS patients with viral and bacterial AECRS had significantly higher symptoms and endoscopic scores relative to their baseline.

2:31 pm – 2:37 pm
**Comparative effectiveness of medical and surgical treatment for recurrent acute rhinosinusitis**
Connor Hunt, BS
Chadi Makary, MD, FARS
Zayd A-Asadi, Medical Student
Hassan Ramadan, MD, FARS
West Virginia University

Objective:
To compare the effectiveness of the medical and surgical treatments in patients with recurrent acute rhinosinusitis (RARS).

Methods:
Retrospective cohort study of patients presenting to the otolaryngology clinic with RARS as defined by four or more episodes of acute rhinosinusitis (ARS) with at least one objective evidence of rhinosinusitis (CT scan or endoscopy findings). Patients' characteristics and comorbidities were reviewed. Primary outcome was the 22-items sinonasal outcome test (SNOT-22) at 3-4 months and at 6-9 months follow up. Medical treatment consisted of intranasal steroid spray, intranasal histamine spray,

saline rinses, or combinations of all. Surgical intervention consisted of septoplasty, endoscopic sinus surgery (ESS), or both.

Results:
123 patients were included, 83 in the medical cohort and 50 in the surgical cohort. Mean age, gender, endoscopy scores, and comorbidities (including allergic rhinitis, asthma, obstructive sleep apnea, primary antibody deficiency, and smoking status) were similar in both cohorts ($p>0.05$ for all). Surgical patients had higher prevalence of nasal septal deviation (71.7% vs 45.7%, $p=0.005$), higher CT scores (5.4 vs 2.1, $p<0.001$), and higher baseline SNOT-22 scores (55.2 vs 44.8, $p=0.037$). Patients treated medically showed improvement in SNOT scores at 6-9 months, whereas surgical patients showed improvement at 3-4 months and 6-9 months follow up. The decrease in SNOT scores was higher in the surgical patients both at 3-4 months (25.1 vs 6.5, $p<0.001$) and 6-9 months (26 vs 11.5, $p=0.001$).

Conclusion:
Both medical and surgical treatment can be effective to RARS. Surgical intervention is superior in the appropriate patients.

2:38 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 p
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: RARS Surgery v. Medical Management**
Moderator: Sandra Lin, MD, FARS
Panelists: Chadi Makary, MD, FARS; Jennifer Villwock, MD Moderators: Victoria Lee, MD, FARS; Kenneth Rodriguez, MD

3:31 pm – 3:37 pm
**Linguistic gender differences in rhinology fellowship LORs: A multi-institutional temporal study**
Vikram Vasan, BA
Christopher Cheng
Shaun Edalati
Shreya Mandloi
David Lerner, MD
Anthony Del Signore, MD, FARS
Madeleine Schaberg, MD
Satish Govindaraj, MD, FARS
Mindy Rabinowitz, MD FARS
Gurston Nyquist, MD, FARS
Alfred Marc Iloreta, MD

Introduction:
Given the previously documented gender gap within Rhinology, it is imperative to identify barriers to gender inclusivity, including the Rhinology fellowship application process. We aimed to augment our previous two-year pilot study with a multi-institutional large cohort and over nine years further characterizing gender differences in letters of recommendation (LORs) for Rhinology fellowship.

Methods:
LORs from 2015-2023 to two Rhinology fellowship programs were analyzed. Sentiment scores were generated using an NLP package. Empath, a deep learning peer-reviewed tool, categorized text into scores and Wilcoxon rank-sum tests compared between genders.

Results:
There were 208 male and 49 female applicants. Male LORs had higher sentiment scores ($p<0.001$). Among Empath sentiment categories, male applicants had more words related to achievement ($p=0.015$), positive emotion ($p<0.001$), trust ($p<0.001$), leader ($p<0.001$), and valuable ($p<0.001$). Temporally, Empath categories achievement, trust, leader, and valuable were consistently higher for male LORs over the nine years. Though these category gaps narrow in the recent years (2021-2023), male applicant LORs remain higher in 2023.

Conclusion:
Over nine years, we found a persistent and sizable gender gap among applicants to Rhinology. Linguistic content heavily favored male applicants, to a larger degree than found in our previous pilot study with the addition of achievement, positive emotion, and valuable. Although evidence of gender bias appears to have diminished over recent years, the gap remains for both LOR linguistic content and number of applicants. Our study provides evidence that more work is necessary to promote gender inclusivity in Rhinology moving forward.

3:38 pm – 3:44 pm
**The impact of cadaveric donor transplant on the development of chronic rhinosinusitis**
Estephania Candelo, MD, MSc
Karol Avila-Castano, MD
Anyull D. Bohorquez Caballero, MD
Angela M. Donaldson, MD, FARS
Mayo Clinic

Introduction:
Several measures have been implemented to increase access to organs for transplantation. As the number of transplants increases, it becomes imperative to understand the potential complications associated with the use of cadaveric versus living donor transplants. Our aim is to determine if the use of cadaveric versus living donor organs is associated with a higher risk of developing CRS and subsequent recalcitrant disease.

Methods:
This is a retrospective cohort study of 2,128 transplant recipients seen at Mayo Clinic between

2017 and 2022. 1,161 patients met the inclusion criteria and were categorized based on whether they received a cadaveric or living donor transplant. Regression models were used to identify donor type effect on rates of CRS and subsequent development of recalcitrant disease.

Results:
1,161 underwent solid organ transplantation from either a living or cadaveric donor. 325 (27.9%) developed CRS and 135 (41.5%) developed recalcitrant CRS. Cadaveric transplant patients were 1.73 times more likely to develop recalcitrant CRS (95% CI: 1.2-2.5, p=0.002). An organ-specific analysis showed that living kidney transplantation had a protective effect against CRS development (OR=0.12, 95% CI: 0.06-0.21, p<0.0001), whereas cadaveric liver transplantation was associated with an increased risk. In those with recalcitrant CRS, living kidney transplant was protective (OR=0.11, 95% CI: 0.04 - 0.30, p<0.0001), while cadaveric liver transplant has a higher risk (OR=3.5, 95% CI: 1.2-12.5, p=0.01).

Conclusion:
The risk of CRS in cadaveric transplants is significantly higher than in those receiving living donor transplants. Living kidney and liver transplants may have a protective effect on CRS.

3:45 pm – 3:51 pm
**ETDQ-7 poorly predicts eustachian tube dysfunction in patients with tinnitus**
Najm Khan, MBS
Aatin Dhanda, Clinical Research Fellow
Kenny Lin
Lauren Brewster, Medical Student
Masayoshi Takashima, MD, FARS
Omar Ahmed, MD, FARS
Jeffrey Vrabec, Professor
Houston Methodist Hospital

Background:
Eustachian tube dysfunction (ETD) is a common condition associated with otologic and rhinologic symptoms. The Eustachian Tube Dysfunction Questionnaire-7 (ETDQ7) is validated for assessment of ETD but the symptoms it queries are present in many inner ear pathologies. This study aimed to determine the correlation between tinnitus scores and total ETDQ7 scores.

Methods:
This prospective observational study recruited patients from July 2023 – October 2023 at a single tertiary care medical center. Included patients were those presenting for hearing loss or tinnitus and completed both ETDQ7 and tinnitus handicap index (THI) questionnaires. Statistical significance and Spearman's rank order correlation were assessed using R version 4.3.1.

Results:
Of the 78 consecutive patients with hearing loss or tinnitus, 64 completed both questionnaires and were included. Median age was 62.50 [IQR 45.25, 69.25], 60% reported tinnitus, and 78% had an ETDQ7 > 14.5. Median ETDQ7 tinnitus (ETDQ7-t) score was 5 [3.75,7], median total ETDQ7 was 18.50 [15,25], and median THI was 20 [8, 34]. Patients with ETDQ7 > 14.5 had higher ETDQ7-t scores (5.50 vs 3, p = < 0.001), total ETDQ7 scores (20 vs 11, p = <0.001), and THI scores (22 vs 7, p = 0.001). There were significantly positive correlations between ETDQ7-t scores and total ETDQ7 (rs = 0.53, p = < 0.001), ETDQ7-t score and THI (rs = 0.78, p = < 0.001), and total ETDQ7 and THI (rs = 0.56, p = < 0.001).

Conclusion:
Patients presenting with tinnitus can have an elevated ETDQ7 which may falsely suggest a diagnosis of eustachian tube dysfunction. Physicians utilizing this questionnaire to diagnose or quantify ETD severity should be cautious when even mild tinnitus is present.

3:52 pm – 3:58 pm
**Effectiveness of hypertonic saline post-endoscopic sinus surgery**
Rodolfo Giffoni
Julieta Hernandez, MD
Victor Sena
Gabriele Santos
Ricardo Aguiar
Maria Dalmaschio, MD
Marcelo Cruz, MD
Adriano Lima, MD

Introduction:
Nasal douching after functional endoscopic sinus surgery (FESS) is a standard postoperative care related to healing mucosal wounds, and reduction of edema and inflammatory symptoms. However, it's still not clear the superiority of hypertonic or isotonic saline for this role.

Methods:
We searched PubMed, Embase, and Cochrane Central Register of Controlled Trials for studies comparing hypertonic with isotonic saline irrigation after FESS in adult patients with chronic rhinosinusitis (CRS). Outcomes were presence of nasal crusts, polypoid mucosa, and variation from the baseline of Sino-Nasal Outcome Test (SNOT) 20/22 and visual analog scale (VAS). For statistical analysis, we used RevMan 5.4.1, and assessed heterogeneity with I2 statistics.

Results:
We included a total of 479 patients from 7 studies. In the hypertonic saline group, there was a reduction in the nasal crust risk ratio (RR) (RR 0.65; 95% CI 0.49 to 0.87) after 30-45 days and severe crusts at 14-21 days (RR 0.59; 95% CI 0.38 to 0.91). Additionally, the

persistence of polypoid mucosa was lower in the intervention arm (RR 0.53; 95% CI 0.43 to 0.65) after 14-21 days. In the symptomatic evaluation, hypertonic saline group showed an improvement in postoperative symptoms by a VAS mean difference (MD) (MD -5; 95% CI -5.77 to -4.24) and a SNOT 20/22 standard mean difference (SMD) (SMD -1.65; 95% CI -2.7 to -0.61) reduction from baseline in 30-45 days.

Conclusion:
Hypertonic saline showed a superior improvement in postoperative evaluation by means of nasal crusting, mucosal healing aspect, and nasal inflammatory symptoms compared with isotonic saline irrigation.

3:59 pm – 4:05 pm
**Spending, utilization, and coverage for CRSwNP therapies among Medicare Advantage beneficiaries**
Akash Bhat, BS
Vinay Rathi, Physician
Zachary Soler, MD, FARS
Rodney Schlosser, MD, FARS
Medical University of South Carolina

Background:
The FDA has recently approved drugs to treat chronic rhinosinusitis with nasal polyps (CRSwNP). However, there are concerns that prices may financially strain Medicare patients and budgets.

Methods:
Using the Optum Clininformatics® database, we conducted a retrospective cross-sectional analysis of condition-specific spending and utilization among Medicare Advantage patients with CRSwNP between fiscal years 2020-2022 prescribed the following drugs: fluticasone exhalation delivery system (EDS-FLU), dupilumab, omalizumab, mepolizumab, and other drugs (e.g., steroid sprays). We stratified spending by responsible party (payer or out-of-pocket) and patient characteristics (+/-comorbid asthma and +/- sinus surgery during year). We further analyzed Medicare Part D plan coverage for each drug using the 2023 Q2 formulary file.

Results:
Among all patients with CRSwNP, mean annual spending was highest for patients receiving dupilumab ($28,284); spending for mepolizumab ($18,820; -33.5% relative difference [RD]), omalizumab ($14,717; -48.0% RD), and EDS-FLU ($5,796; -79.5% RD) cohorts were lower. Out-of-pocket spending among cohorts ranged from $432 (other drugs) to $2,774 (omalizumab). Most of the biologic drug cohorts (range: 58.8% [dupilumab] to 80.1% [omalizumab]) were +asthma/-surgery and a plurality of the EDS-FLU (40.5%) cohort was -asthma/-surgery. While the majority of Medicare Part D formularies covered biologics (range: 61.3% [mepolizumab] to 100.0% [omalizumab]), one-third (37.2%) covered EDS-FLU.

Conclusions:
CRSwNP-specific spending varied widely by prescription drug among Medicare Advantage patients. Plan coverage rates and spending (total and out-of-pocket) were higher for biologic drugs compared to EDS-FLU.

4:05 pm – 4:11 p
**Q&A**

4:12 pm – 4:55 pm
**Panel: “Challenges in Pediatric Rhinology”**
Moderator: David Gudis, MD, FARS
Panelists: Angela Donaldson, MD, FARS; Amrita Ray, MD, FARS; Chadi Makary, MD, FARS

4:55 pm – 5:00 pm
**Q&A**

5:00 pm – 5:30 pm
**ARS Business Meeting**

5:30 pm – 7:00 pm
**ARS President’s Reception**
Plaza Ballroom

# Thursday, May 16, 2024
# Afternoon Session
# Grand Ballroom AB
# 1:00 pm – 5:05 pm CST

7:00 am – 12:00 pm
**ARS Board of Directors Meeting**
**Plaza Ballroom**

*Moderators: David Gudis, MD, FARS; Elisa Illing, MD, FARS*

1:00 pm – 1:06 pm
**Autoimmune dysregulation in children with chronic rhinosinusitis**
Sairisheel Gabbireddy, MD
Chadi Makary, MD, FARS
Hassan Ramadan, MD, FARS
Sameer Shetty, Medical Student
West Virginia University

Introduction:
Increasing evidence suggests that autoimmune disorders and their immunomodulating medications may increase the risk of rhinosinusitis. This association has had limited investigation in the pediatric population.

Goal:
To determine if autoimmune and autoinflammatory diseases are associated with increased risk of chronic rhinosinusitis (CRS) in children.

Methods:
A 1:1 matched case-control study of 4,498 pediatric patients seen in the West Virginia University in the past 10 years was performed. Cases were children with autoimmune or autoinflammatory diseases. Controls were children without any autoimmune or autoinflammatory disorders. Logistic regression calculated odds ratio (OR) with 95% confidence intervals (CI) while adjusting for confounders. Stratification by disease type (autoimmune vs autoinflammatory diseases) was performed to study the risk of CRS in each of the disease types.

Results:
2249 children with autoimmune/autoinflammatory diseases were matched with 2249 controls (both with mean age of 12.4 years, 57.6% female, 90.7% white). Children with autoimmune/autoinflammatory diseases were at increased risk for CRS [OR=4.8, p<0.01], chronic rhinitis [OR=3.3, p<0.01], asthma [OR=2.7, p<0.01], upper respiratory infections [OR=2.1 p<0.01], and immunodeficiency disorders [OR=27.2, p<0.01]. When stratified by type of the disease, autoinflammatory diseases showed stronger association with CRS (OR=8.0, p<0.01 vs OR=3.4, p<0.01), chronic rhinitis (OR=6.6, p<0.01 vs OR=2.9, p<0.01), and asthma (OR=7.7, p<0.01 vs OR=1.9, p<0.01) than autoimmune diseases.

Conclusion:
Autoimmune and autoinflammatory disorders increase the risk of CRS, chronic rhinitis, and asthma in children.

1:07 pm – 1:13 pm
**National pediatric acute invasive fungal sinusitis outcomes over a 13-year period**
Matthew Wu, MD
Marie-Ange Munyemana
Lauren Roland, MD

Objectives:
Acute invasive fungal sinusitis (AIFS) is a morbid disease, especially rare in the pediatric population, and often managed surgically. We aim to assess prognostic factors in treated pediatric AIFS patients over a 13-year period in the United States (US).

Methods:
The Kids' Inpatient Database, the largest US public database of pediatric hospitalizations, was used to identify surgically treated AIFS patients from 2006-2019 with diagnosis and procedure codes. Demographic data, mortality rate, immunocompromised states, and fungal species were assessed. Fisher's exact test was used to compare the number of patients who died with immunocompromised states and the number of patients based on sex, age, and fungal species. The median age was used to stratify patients into younger (<6 years) and older (≥6 years) groups.

Results:
A total of 408 treated AIFS patients were identified. The median age was 12 years (IQR: 7-16) and 59% were male. The most common comorbidities were neoplasms (75.7%), hematologic disorders (71.2%), followed by immunodeficiencies (e.g. severe combined immunodeficiency) (18.3%). Common fungal species were non-aspergillosis/mucormycosis species (53.8%), mucormycosis (35%), and aspergillosis (25.3%). The overall mortality rate was 16.1%. Patients that were male (12.3% vs 3.9%; p=0.004) and older (71.2% vs 28.8%; p=0.038) had higher mortality rates. Immunodeficiencies were the only comorbidity associated with increased mortatlity (25.3%; p=0.023). Aspergillosis infections had the highest mortality (26.2%; p=0.003) compared to other fungal species.

Conclusion:
In this nationally-representative analysis, our findings highlight factors that may prognosticate mortality in pediatric AIFS patients.

1:14 pm – 1:20 pm
**Symptom prioritization for the treatment chronic rhinosinusitis in people with cystic fibrosis**
Christine Liu, BS
Ethan Han, Medical Student
Jakob Fischer, MD
Jess Mace, MPH CCRP
Jeremiah Alt, MD, PhD, FARS
Todd Bodner
Naweed Chowdhury, MD
Peter Hwang MD, FARS
Adam Kimple, MD, PhD, FARS
Timothy Smith, MD, MPH, FARS
Milene Saavedra
Jennifer L. Taylor-Cousar
Daniel Beswick MD, FARS
University of California, Los Angeles

Chronic rhinosinusitis (CRS) is common in people with cystic fibrosis (PwCF). Rhinologic symptom prioritization and areas that influence CRS treatment choices, including pursuing endoscopic sinus surgery (ESS), remain understudied. Adult PwCF+CRS were enrolled at eight centers into a prospective, observational study (2019-2023). Participants were administered a SNOT-22 survey and a modified SNOT-22 instrument on symptom importance. We determined importance rankings for individual symptoms and means of SNOT-22 symptom importance subdomains in two sets of subgroups – those pursuing ESS vs. continuing medical management (CMT), and those on elexacaftor/ tezacaftor/ ivacaftor (ETI) vs. not on ETI. Among 69 participants, the highest priorities were nasal congestion (n=48, 69.6% important), post-nasal discharge (32, 46.4%), facial pain (29, 43.3%), waking up tired (27, 39.1%), and fatigue (26, 37.7%). Those electing ESS (n=23) prioritized sleep and psychological dysfunction symptoms compared to those pursuing CMT (n=49) [sleep: median score = 19.0 (IQR: 12.0, 25.0) vs. 4.5 (0.0, 12.8); p<0.0001; psychological: 17.0 (7.0, 26.0) vs. 7.0 (0.0, 15.8); p<0.01]. The ETI group had comparable SNOT-22 total symptom importance scores to the non-ETI group (p=0.14). Non-ETI users (n=34) showed a trend toward prioritizing sleep symptoms compared to ETI users (n=35) (13.0 (2.8, 22.3) vs. 6.0 (2.0, 17.0); p=0.055). Nasal congestion and post-nasal discharge were top priorities in PwCF+CRS. Those electing ESS emphasized sleep and psychological symptoms, underscoring their importance in pre-operative discussions. Preference for sleep improvement in non-ETI users, compared to ETI users, highlights their unique disease impact and therapeutic needs.

1:21 pm – 1:27 pm
**Impact of elexacaftor/tezacaftor/ivacaftor on rates of FESS in cystic fibrosis**
Mihai Benton, BA
Graham Pingree, BA
Thomas Fitzpatrick, MD
Theodore Schuman, MD, FARS
VCU School of Medicine

Introduction:
Elexacaftor/tezacaftor/ivacaftor (Trikafta) is a combination cystic fibrosis transmembrane receptor (CFTR) modulator that has demonstrated improved pulmonary outcomes in patients with cystic fibrosis (CF). Despite suggested benefits, Trikafta's impact on functional endoscopic sinus surgery (FESS) remains unknown.

Methods:
The TriNetX Analytics Research Network was queried from 2019-2023 (Trikafta's market lifespan) for subjects with CF who underwent sinus surgery. Patients on Trikafta prior to FESS were propensity score matched to control patients on other FDA-approved CFTR modulators (tezacaftor/ivacaftor, lumacaftor/ivacaftor, ivacaftor) based on age, race, sex, and nasal polyposis. The primary outcome comprised the absolute risk reduction (ARR) of undergoing FESS. Secondary outcomes included ARR of pneumonia, readmission, and revision from 0-6, 6-12, and 12-24 months postoperatively.

Results:
Use of Trikafta demonstrated a significant ARR for FESS (0.05; 95%CI 0.04-0.06; p-value:<0.0001) when compared to controls. From 0-6 months post-op, those on Trikafta had a significant ARR of pneumonia (0.14; 95%CI 0.03-0.25; p-value:0.01) and readmission (0.16; 95%CI 0.02-0.30; p-value:0.02) when compared to controls. From 12-24 months there was a significant ARR of pneumonia (0.11; 95%CI 0.003-0.21; p-value:0.046) with no significant ARR in readmission. There were no differences between groups in rates of revision FESS.

Conclusion:
Patients on Trikafta demonstrated a significantly reduced risk of undergoing FESS, post-operative readmission, and pneumonia when compared to patients on other CFTR modulators, suggesting enhanced benefit on sinonasal disease in CF. Further study is warranted to examine these effects.

1:28 pm – 1:32 pm
**Q&A**

*Moderators: Charles Ebert, MD, FARS; Caitlin McLean, MD*

1:33 pm – 1:39 pm
**Machine learning predicts presence of sinonasal inflammation on CT using patient-generated data**
Arun Raghavan, MD
Mohamed Aboueisha, MD
David Cvancara, BS
Ian Humphreys, DO, FARS
Waleed Abuzeid, MBBS, FARS
Aria Jafari, MD, FARS

University of Washington

Background:
The diagnosis of chronic rhinosinusitis (CRS) relies upon the presence of both patient-reported symptoms and objective measures – either nasal endoscopy or computed tomography (CT) findings. A considerable subset of patients with CRS lack exam findings that corroborate the diagnosis. Herein, we explore the feasibility of leveraging patient-generated health data to predict the presence of sinonasal inflammation on CT using machine learning.

Methods:
426 patients were evaluated at a tertiary care rhinology clinic and subsequently underwent CT imaging studies, which were assigned Lund-Mackay scores (LMS). Relevant patient history, symptoms, and Sino-Nasal Outcome Test-22 scores were collected via an electronic platform prior to in-person evaluation. A Random Forest Classifier (RFC) was trained using predictors drawn from pre-evaluation patient-generated health data and tested for classification accuracy via 5-fold cross validation.

Results:
A total of 58 predictors were extracted from the patient-generated health data. At an LMS threshold of greater than or equal to 6, the RFC obtained a classification accuracy of 64.3% ($p < 0.001$), specificity of 97.13%, and sensitivity of 10.71%. Furthermore, the RFC independently predicted LMS independent of standalone clinical factors based on linear regression analysis.

Conclusion:
A machine learning model using pre-clinical patient-generated health data achieved a specificity of 97.13% in predicting CT-positive CRS (LMS≥6). This suggests its potential as a screening tool for CT-positive CRS, potentially reducing the need for unnecessary medical therapy and imaging. Further research with a larger cohort is needed to confirm and expand upon these findings.

1:40 pm – 1:46 pm
**Multi-institutional validation of an AI-based sinus CT analytic algorithm**
Conner Massey, MD
Jess Mace, MPH, CCRP
Zachary Soler, MD, FARS
Timothy Smith, MD, MPH, FARS
Stephen Humphries, Assistant Professor
Vijay Ramakrishnan, MD, FARS

Background:
We previously developed and validated an automated AI-based algorithm for volumetric analysis of sinus CT. Prior work from a single institutional cohort demonstrated a strong correlation of algorithm-derived percent sinus cavity opacification with Lund-Mackay scoring (LMS). LMS is the current gold standard for measuring radiologic disease in CRS, but has limitations. We hypothesize that volumetric analysis with percent opacification would correlate better than LMS with disease severity and surgical outcomes.

Methods:
Adults with CRS were prospectively enrolled into a multi-institutional study. Patient reported and objective outcomes, including olfactory assessment (Sniffin' Sticks TDI score) were measured. CT images were analyzed as previously described. Spearman correlation was used for statistical analysis.

Results:
85 subjects were included. Automated CT analysis performed comparably when compared to LMS. The algorithm-derived percent sinus opacification strongly correlated with LMS overall ($r = 0.86$, $p < 0.01$). Moderate correlation was seen between olfactory TDI scores and both the LMS and algorithm-derived percent opacification ($r = -0.58$, $p < 0.01$ and $r = -0.51$, $p < 0.01$, respectively). When divided by sinus, the algorithm-TDI correlations were strongest in the sphenoid and maxillary sinuses ($r = -0.52$, $p < 0.001$ for both), while the strongest LMS-TDI correlations were seen in the sphenoid and posterior ethmoids ($r = -0.53$, $p < 0.001$ for both).

Conclusion:
Our CNN method successfully analyzed CT scans from 3 separate institutions and performed well compared to the gold standard LMS score while eliminating its subjectivity, time intensiveness, and potential for human error.

1:47 pm – 1:53 pm
**3D surgical planning software to improve resident frontal sinusotomy**
Andrew Kelly, MD
Isaac Schmale, MD
Li-Xing Man, MSc, MD, FARS
Paul Allen, PhD
University of Rochester Medical Center

Introduction:
Variable and complex anatomy make frontal sinusotomy (FS) a challenge for trainees. We sought to improve resident FS skill acquisition by incorporating 3-dimensional surgical planning software (3DS) in the resident education process.

Methods:
This is a prospective randomized trial with residents alternating their method of preparation before FS. Control cases involve standard preparation while experimental cases involve standard preparation plus use of 3DS. Visual sliding scales ranging from 0 to100 were used for self and faculty evaluation, with the faculty blinded to the mode of preparation.

Results:

Thirty-five FS procedures were recorded across 7 residents. Residents reported that they performed an increased percentage of the FS if they prepared with 3DS (85% vs 62%, p = 0.025). Residents also felt significantly better prepared to perform a FS when they utilized 3DS for surgical planning (78/100 vs 64/100, p = 0.020). Blinded attendings reported the residents who prepared with 3DS were significantly better at identifying and cannulating the frontal sinus drainage pathway (69/100 vs 42/100, p = 0.037). Across all cases, residents felt they performed a greater percentage of the FS compared to what their supervisors reported (75% vs 56%, p = 0.026).

Conclusions:
Residents who utilized 3DS for FS felt better prepared and reported performing a greater percentage of the procedure. Furthermore, attendings reported that residents were better at identifying and cannulating the frontal sinus drainage pathway for cases in which 3DS was used. 3DS appears to be a valuable surgical planning and education tool with the potential to improve resident FS performance.

1:54 pm – 2:00 pm
**The use of a convolutional neural network to automate radiologic scoring of CT sinuses**
Daniel Lee, MD, FRCSC
Mohammad Hamaghalam
Lily Wang
Hui-Ming Lin
Muhammad Mamdani
Amber Simpson
Errol Colak
John Lee, MD
University of Toronto

Background:
Chronic rhinosinusitis (CRS) is diagnosed with symptoms and objective endoscopy or computed tomography (CT). The Lund-Mackay Score (LMS) is often used to determine the radiologic severity of CRS and make clinical decisions. The objective of this study was to develop an automated algorithm with the use of convolutional neural network (CNN) to segment and quantitatively evaluate each sinus with LMS.

Methods:
Radiology Information System was queried for outpatient paranasal sinus CTs at a tertiary institution. We identified 1,400 CT scans which were manually labelled with LMS of individual sinuses. Seventy-seven CT scans with 11,500 coronal cuts were segmented manually for individual sinuses. A CNN model was trained to segment each sinus region. A Dice score was generated to evaluate the performance of the model. The LMS model was developed with image thresholding and pixel counting.

Results:
Overall, our CNN model for segmentation achieved a mean Dice score of 0.85 for all sinus regions, except for the osteomeatal complex. For The individual Dice scores showed 0.95, 0.71, 0.78, 0.93, 0.86 for the maxillary sinus, anterior ethmoidal sinus, posterior ethmoidal sinus, sphenoid sinus, and frontal sinus, respectively. The model for LMS showed a high degree of accuracy with a score of 0.92, 0.99, 0.99, 0.97, 0.99 for the maxillary sinus, anterior ethmoidal sinus, posterior ethmoidal sinus, sphenoid sinus, and frontal sinus, respectively.

Conclusion:
Reporting of paranasal sinus CT can be automated and potentially standardized with a CNN model to provide accurate scoring of individual sinuses.

2:01 pm – 2:05 pm
**Q&A**

*Moderators: Peter Papagiannopoulos, MD; Bobby Tajudeen, MD, FARS*

2:06 pm – 2:12 pm
**Investigating efficacy and toxicity of topical agents for the treatment of CRS**
Sam Hale, BMedSc(Hons), MBChB
Christian Lux, Dr.
James Willoughby
Arne Koefoed
David Broderick Dr.
Kristi Biswas, Dr.
Raymond Kim, Dr.
Brett Wagner Mackenzie, Dr.
Richard Douglas, Professor
University of Auckland

Background:
The sinonasal cavity is eminently suitable for topical application of treatments for chronic rhinosinusitis (CRS), including agents for eradication of bacterial biofilms implicated in its pathogenesis and suppression of inflammation. We developed a model to investigate the efficacy of such agents in vitro and their toxicity to ciliated epithelium ex vivo, in order to identify those with potential for treating CRS. We have tested products containing polymyxin B, ethylenediaminetetraacetic acid, povidone-iodine, quaternary ammonium compounds, corticosteroids, and tyrosine kinase inhibitors.

Methods:
Biofilms of Staphylococcus aureus and Pseudomonas aeruginosa were grown in vitro using the Centers for Disease Control biofilm reactor and 96-pin lids. Time-kill and minimum biofilm eradication concentration assays, and scanning electron microscopy, were used to assess antibiofilm efficacy. An explant model was used to measure changes in gene expression following application of immune suppressants ex vivo. Agents were then applied to turbinectomy specimens collected from patients

undergoing surgery for nasal obstruction, and changes in ciliary beat frequency were measured using cytobrush specimens taken from this tissue with high speed videomicroscopy.

Results:
Consistent and repeatable measures of antibiofilm and anti-inflammatory efficacy were obtained. Ciliotoxicity testing provided clear discrimination between controls and test products.

Conclusions:
We present a methodological pipeline by which topical agents may be assessed for efficacy and toxicity in vitro and ex vivo. This may facilitate future investigation of antibiofilm and anti-inflammatory agents with potential as novel topical therapies for CRS.

2:13 pm – 2:19 pm
**Orbital decompression for thyroid eye disease: Outcomes by preoperative severity and technique**
Lazaro Peraza, MD
Forrest Fearington
Andrew Awadallah, Medical Student
Gabriel Hernandez-Herrera, Medical Student
Lilly Wagner, Consultant
Janalee Stokken, MD, FARS
Background:
Current literature suggests that proptosis reduction following orbital decompression varies depending on the extent of preoperative proptosis. However, no study has stratified endoscopic decompression outcomes by preoperative (preop) Hertel exophthalmos.

Aim:
We seek to stratify Hertel proptosis reduction outcomes by preop Hertel value and surgical technique.

Methods:
Retrospective chart review of 136 patients (233 eyes) who underwent orbital decompression for Thyroid Eye Disease via various surgical approaches including endoscopic medial wall, orbital floor takedown, and/or open lateral wall decompression. Relevant patient data was collected including preoperative comorbidities and Hertel exophthalmometry.

Results:
Univariable mixed effects analysis showed that preop Hertel ($p<0.0001$) and surgical approach ($p = 0.04$) were significantly associated with postoperative proptosis reduction. Patients were divided into groups based on preop Hertel (<20, 20-24, 24-28, 28+) and then subdivided further by surgical technique. Endoscopic medial wall plus open lateral wall takedown led to a reduction in proptosis ranging from an average of 2.20 ± 2.23 mm with preop Hertel <20 mm, to 3.92 ± 1.84 mm when preop Hertel was between 24-28 mm. Three-wall surgery led to a reduction in proptosis ranging from an average 3.72 ± 1.72 mm when preop Hertel was <28 mm to 6.38 ± 1.22 mm when preop Hertel was >28 mm. Lateral wall decompression effect also ranged greatly from 1.33 ± 0.75 mm in Hertel <20 mm to 4.88 ± 2.26 mm in Hertel >28 mm.

Impact:
These findings inform providers and patients of the expected reduction in proptosis after various orbital decompression techniques based on preoperative exophthalmometry values.

2:20 pm – 2:26 pm
**Post-operative outcomes of benign orbital tumor resection are independent of tumor size & morphology**
Angela Zhu, BA
Ryan Bartholomew
Yan Zhao
Margaret Mitchell
Benjamin Bleier, MD, FARS
Barak Ringel, MD
Brown University Alpert Medical School

Objectives:
Surgical complexity and post-operative complication rates of primary benign orbital tumors (BOTs) are known to increase with ORBIT Class. While tumor location and ORBIT Class have been shown to influence surgical approach and outcomes, there is a poor understanding of whether tumor size and morphology have similar effects. Thus, our objective was to determine if morphometric characteristics were associated with certain post-operative outcomes.

Methods:
Demographic and clinical data of patients identified with BOTs at our institution were collected. 3D-slicer, an open-source application, was used for MRI-based three-dimensional tumor segmentation and calculation of volume and sphericity, a radiomic feature that describes how close a given volume is to a perfect sphere.

Results:
A total of 44 patients with surgically resected BOTs were identified. The average patient's age was 48.0±17.8 years, with slight female predilection (65.9%). The most common ORBIT stage was stage 2 (34.1%). The mean tumor volume was 4467.8±3334.3mm^3. Neither tumor volume nor sphericity were associated with the need for intra-operative reconstruction ($p=0.853$, $p=0.226$), post-operative visual deficits ($p=0.721$, $p=0.596$), nor post-operative hemorrhage ($p=0.415$, $p=0.263$) while adjusting for ORBIT Classes.

Conclusions:

Tumor radiomic features such as volume and sphericity did not influence the need for reconstruction, or post-operative complications in our series. Surgical outcomes for BOT resection, therefore, appear to be dominated by ORBIT Class regardless of size and morphology.

2:27 pm – 2:33 pm
**Virtual reality and wearable devices after skull base surgery**
Vivek Pandrangi, MD
Ana Araujo
Michelle Buncke
Brennan Olson
Matthew Jorizzo
Olabisi Sanusi, Assistant Professor of Neurological Surgery
Alessa Colaianni
Paul Flint
Mark Wax
Mathew Geltzeiler, MD, FARS
Ryan Li
Oregon Health & Science University

Background:
A randomized controlled trial evaluating use of virtual reality (VR) and wearable activity devices among patients undergoing inpatient surgery was performed, and the purpose of this study was to evaluate patterns of device use among the subset of patients who underwent skull base surgery.

Methods:
A prospective, 4-arm, randomized controlled trial among patients undergoing inpatient surgery at a tertiary academic center study was performed from November 2021 to July 2022. Patients were randomized to control, VR, Fitbit, or combined VR+Fitbit groups. Patients in the VR groups were brought VR headsets to use, and patients in the Fitbit groups were encouraged to achieve 2,000 daily steps. Patients who underwent skull base surgery were then evaluated.

Results:
Among the 80 patients in the cohort, 24 patients underwent skull base surgery (Control=16.7%; VR=33.3%; Fitbit=25.0%, VR+Fitbit=25.0%). The majority of patients were male (58.3%) and mean ± SD age was 49.2 ± 17.5 years. Among the VR and VR+Fitbit groups (n=14), VR was used 38% of the time it was brought for use (declined 60%). Median [Interquartile Range] reduction in post-VR pain scores was 1.0 [2.0] on a 10-point scale, and median time of VR use was 24.5 [12.0] minutes. Among patients in the Fitbit and VR+Fitbit groups (n=12), there were 40 hospital days included and median daily step count was 1,580 [1,836] steps. Daily steps > 2,000 steps were achieved 32% of the time. Patients in the VR+Fitbit cohort had reduced average daily pain scores compared to control patients (1.2 [2] vs. 3.7 [5], p=0.04).

Conclusions:
Utilization of VR and wearable activity devices in postoperative recovery after skull base surgery appears feasible and may facilitate pain control.

2:34 pm – 2:40 pm
**AI-modified and generated patient education materials for skull base surgery**
Michael Warn, BS
Leo Meller, BS
Daniella Chan
Sina Torabi, MD
Benjamin Bitner, MD
Edward Kuan, MD, FARS
UC Riverside

Objectives:
Despite NIH/HHS recommendations to publish online patient education materials (PEMs) at or below sixth-grade literacy, articles pertaining to endoscopic skull base surgery (ESBS) have lacked readability and quality. ChatGPT is artificial intelligence capable of synthesizing vast internet data to generate text responses to queries. We examined the current state of readability and quality of online PEMs for ESBS and determine the utility of ChatGPT to both improve the readability of existing articles and generate de-novo PEMs that are both accessible and quality.

Methods:
An article search was performed utilizing ten different search terms related to ESBS. The ten least readable existing articles was modified with ChatGPT and iterative queries were used to generate an article de-novo. The Flesch Reading Ease (FRE) and related metrics measured overall readability and content literacy level, while DISCERN assessed article reliability and quality.

Results:
67 articles were located. ChatGPT significantly improved FRE readability of the ten least readable online articles (19.7±4.4 vs. 56.9±5.9, p<0.001), down from university to 10th grade level. The ChatGPT article was more readable than 47.8% of existing articles (38.4 vs. 39.5±12.4) and higher quality than 94% of articles (51.0 vs. 37.6±6.1). 56.7% of the online articles received were poor quality.

Conclusion:
ChatGPT can improve the readability of the least readable articles, most of which still remain above the recommended literacy level for PEMs. With iterative queries, ChatGPT generates more reliable and higher quality PEMs for ESBS compared to most existing online articles and can be tailored to match the readability of the average online article.

2:40 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: Draf III and Other DrillOuts: The Mucosal Coverage Controversy**
Moderator: Jivianne Lee, MD, FARS
Panelists: Pete Batra, MD, FARS; Jessica Grayson, MD

Moderators: Anthony Del Signore, MD; Mathew Geltzeiler, MD, FARS; Katie Melder, MD

3:31 pm – 3:37 pm
**Prognostic significance of dysplasia in sinonasal inverted papilloma: A multi-institutional study**
Alexis Kim, BA
Charles Tong, MD, FARS
Edward Kuan, MD, FARS
Lenox Hill Hospital/Northwell Health

Sinonasal inverted papilloma (IP) is a typically benign sinonasal tumor with a tendency to recur and potential for malignant transformation. Varying degrees of dysplasia may be present, of which carcinoma-in-situ (CIS) is the most advanced. We aim to evaluate the effect of dysplasia on tumor behavior and patient outcomes.

Methods:
Retrospective chart review of IP cases from 2002 to 2023 treated by fellowship-trained rhinologists at ten institutions. Pertinent clinical data was obtained, and all IPs were histologically analyzed by pathologists.

Results:
515 patients were eligible for analysis. The mean age was 58 years with an average postoperative surveillance of 40.5 months. The majority of patients had tumors without dysplasia (66.8%), with the rest with mild dysplasia (2.8%), moderate dysplasia (9%), severe dysplasia (15.6%), and squamous cell carcinoma (5.7%). The distribution of unifocal attachment across the cohorts containing no dysplasia to severe dysplasia ranged from 48-51%, while invasive disease significantly favors multifocal attachment at 91.2%. The overall recurrence rate was 16.6% and there was no statistically significant difference in recurrence between the cohorts containing no dysplasia, mild dysplasia, and moderate dysplasia. Tumors with severe dysplasia treated with surgery alone were associated with a recurrence rate of 27%, while IP-transformed SCCa treated with multimodality therapy had a recurrence rate of 16.7%.

Conclusions:
IP containing no dysplasia, mild dysplasia, and moderate dysplasia appear to have similar clinical behavior, with lower incidence of multifocal attachment and lower recurrence rates. Tumors containing precancerous changes with severe dysplasia are a challenge to treat.

3:38 pm – 3:44 pm
**The inflammatory environment of sinonasal inverted papilloma**
Alana Ravasio, BS
Vidit Talati, MD, MS
Tamara Simpson, Medical Student
Ali Baird, BS
Paolo Gattuso, MD
Peter Papagiannopoulos, MD
Pete Batra, MD, FARS
Bobby Tajudeen MD, FARS
Peter Filip, MD
Rush Medical College

Background:
Sinonasal inverted papilloma (IP) may be associated with sinonasal inflammation and chronic rhinosinusitis (CRS), independent of tumor obstruction of sinus ostia. While the histology of IP itself is well described, this study aims to characterize the histopathologic features of the sinonasal mucosa surrounding the tumor.

Methods:
A retrospective review of IP patients who underwent tumor resection was performed. Patients with CRS with or without nasal polyps (CRSwNP and CRSsNP, respectively) were included as comparison groups. 13-variable structured histopathology reports were generated for all surgical mucosal specimens.

Results:
Of 60 IP patients, 47 had a primary resection and 13 underwent surgery for recurrence. Compared to CRSwNP, IP patients demonstrated greater neutrophilic infiltrate (23.3% vs. 10.7%, p=0.008), squamous metaplasia (41.7% vs. 22.1%, p=0.002), and fibrosis (75% vs. 18.8%, p<0.001), and less tissue eosinophilia [>10 per high power field] (16.7% vs. 53.9%, p<0.001), basement membrane thickening (11.7% vs. 39.1%, p<0.001), and subepithelial edema (16.7% vs. 35.1%, p=0.006). Compared to CRSsNP, IP patients had increased neutrophilic infiltrate (23.3% vs. 8.9%, p=0.002), squamous metaplasia (41.7% vs. 18.2%, p=0.001), and fibrosis (75% vs. 15.4%, p<0.001).

Conclusion:
Structured histopathologic analysis of inflammatory mucosa associated with IP demonstrates an inflammatory environment more similar to that of CRSsNP than CRSwNP. This suggests an inflammatory profile comparable to type 1 and 3 endotypes, driven by Th1 and Th17, respectively. Fibrosis among IP patients may suggest a component of tissue remodeling, and increased squamous metaplasia alludes to the role of HPV in tumorigenesis.

3:45 pm – 3:51 pm
**Advancing IP and IP-SCC diagnosis: AutoML vs. traditional deep learning**
Farideh Hosseinzadeh, MD
S. Saeed Mohammadi
James N. Palmer, MD, FARS
Michael A. Kohanski, MD
Nithin D. Adappa, MD, FARS
Michael T. Chang, MD
Peter Hwang, MD, FARS
Jayakar Nayak, MD, PHD
Zara Patel, MD, FARS

Background:
Traditional deep machine learning and newer automated machine learning (AutoML), have offered promising solutions for enhancing the accuracy of diagnostic processes. Here, we compare the potential of these technologies in the context of diagnosing IP and IP-SCC.

Methods:
An imaging dataset was previously compiled from two medical institutions. This dataset included preoperative MRI scans along with corresponding surgical pathology reports. Vertex AI, a Google Cloud AutoML platform was compared with previously used traditional neural networked machine learning (All-Net).

Results:
Records from 90 patients with either IP (n = 64) or IP-SCC (n = 26) were used. In terms of sensitivity, the autoML model demonstrated a 75% accuracy rate in correctly identifying IP-SCC cases from IP, while specificity was robust at 92%. Overall, the model achieved an accuracy rate of 83.5%, better than the previously established 77.9% of All-Net.

Conclusion:
AutoML outperformed All-Net in differentiating between IP and IP-SCC, but still underperformed previously established expert human accuracy with this limited dataset. These findings underscore the potential of AutoML in simplifying the differentiation process between IP and IP-SCC, requiring significantly less effort and minimal coding skills with even more accurate results than prior machine learning models. We plan to apply this improved technology to the more extensive dataset currently being gathered via an international, multi-center collaboration to produce an even more accurate predictive algorithm.

3:52 pm – 3:58 pm
**Prolonged surveillance in inverted papilloma shows late recurrences and no benefit to frozen section**
Kush Panara, MD
Alan Workman, MD
David Lerner, MD
Jadyn Wilensky
Jennifer Douglas, MD
Michael A. Kohanski, MD
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS

Background:
To reduce recurrence rates of inverted papilloma (IP), some have argued for the use of intraoperative frozen margins; results remain mixed and studies critically lack lengthy surveillance periods. We aim to elucidate the impact of prolonged surveillance and intraoperative frozen margins on IP recurrence.

Methods:
This is a retrospective analysis of patients who underwent resection of IP at a tertiary care center over a 10-year period from 2008-2018 followed by subsequent surveillance. Patient demographics, tumor and operative characteristics, and recurrences were analyzed.

Results:
Our analysis includes 199 patients, with 37 recurrences and an average recurrence time of 44.4 months. 57% of patients received intraoperative frozen sections and recurrence rates were similar between those who received frozen sections and those who did not (20.1% vs 15.5%, p = 0.36). Patients with recurrences within 5 years of surgery were more likely to have received frozen sections than those with recurrences beyond 5 years ($p<0.01$). There was no difference in surgical approach or extent of disease in those who received frozen margins. Patients that received frozen sections were more likely to have multiple sites of attachment (56.5% vs 38.1%, p = 0.01) and persistent disease following a previous resection at an outside institution (67.0% vs. 44.0%, p=0.001).

Conclusion:
Our average time to recurrence was 44.4 months, significantly longer than surveillance times reported in the literature, indicating that longer periods of surveillance are necessary. Our analysis is the first and largest cohort to look at IP resection in a standardized fashion and find that recurrence rates are similar between patients receiving frozen sections or not.

3:59 pm – 4:05 pm
**Quality-of-life outcomes following endoscopic resection of sinonasal inverted papilloma**
Arash Abiri
Mandy Salmon, Medical Student
Siddhant Tripathi
Ahmad Sedaghat, MD
James N. Palmer, MD, FARS
Edward Kuan, MD, FARS
University of California, Irvine

Background:
There is growing interest in assessing patient quality-of-life (QOL) following treatment of sinonasal tumors, including inverted papilloma (IP). In this study, we aimed to elucidate the natural history of postoperative QOL outcomes in IP patients treated with surgery.

Methods:
Cases of sinonasal IP treated surgically at 4 tertiary academic rhinology centers were retrospectively reviewed. SNOT-22 scores were used to evaluate QOL preoperatively and postoperatively (1, 3, 6, 12 months). Repeated measures ANOVA assessed for differences in mean scores over time. Linear regression identified factors associated with QOL longitudinally.

Results:
373 patients were analyzed. Mean preoperative SNOT-22 score was 20.6 ± 20.4, which decreased to 16.3 ± 18.8 ($p=0.041$) and 11.8 ± 15.0 ($p<0.001$) at 1 and 3 months postoperatively, respectively. No further changes in SNOT-22 scores occurred beyond 3 months postoperatively ($p>0.05$). When analyzed by SNOT-22 subdomains, nasal, sleep, and otologic/facial subdomain scores (all $p<0.05$) demonstrated improvement at 12-month follow up compared to preoperative scores; this was not observed for the emotional subdomain score ($p=0.800$). Recurrent cases were associated with higher long-term SNOT-22 scores ($\beta=7.08$; $p=0.017$). Age, sex, degree of dysplasia, prior surgery, primary site, and smoking history did not correlate with symptoms (all $p>0.05$).

Conclusions:
QOL outcomes related to IP resection are largely driven by nasal, sleep, and otologic/facial subdomains, though patients appear to experience enduring improvement as early as 3 months postoperatively. Recurrent disease is a major driver of negative QOL.

4:06 pm – 4:12 pm
**Q&A**

4:13 pm – 5:00 pm
**Combined ARS and AHNS Panel: ICSNT: How It Can Help Your Practice**
Moderator: Edward Kuan, MD, FARS
Panelists: Daniel Beswick, MD, FARS; Nyall London, MD, FARS; James Palmer, MD, FARS; Timothy Smith, MD, FARS; Shirley Su, MD; Eric Wang, MD, FARS; Marilene Wang, MD, FARS

5:00 pm – 5:05 pm
**Q&A**

5:05 pm
**Meeting Adjourns**

5:30 pm – 7:00 pm
**ARS and AHNS Combined Reception**
Michigan Ballroom and Foyer

## Thursday, May 16, 2024
## 7:00 am – 12:00 pm
## ARS Board of Directors Meeting
## Plaza Ballroom

**Thursday, May 16, 2024**
**Afternoon Concurrent Session**
**Grand Hall MNL**
**1:00 pm – 5:05 pm CST**

*Moderators: Jean Kim, MD, FARS; Spencer Payne, MD, FARS*

1:00 pm – 1:06 pm
**Medial flap turbinoplasty is unlikely to cause empty nose syndrome**
Yasser Almansour
Abdulghafoor Alani
Carl Wilson, MS
John Craig, MD, FARS

Background:
Empty Nose Syndrome (ENS) can be a debilitating condition affecting a minority of patients who undergo inferior turbinate surgery. The Empty Nose Syndrome 6-item Questionnaire (ENS6Q) was validated to diagnose ENS following inferior turbinate reduction, with an ENS6Q≥11 being suggestive of ENS. Medial flap turbinoplasty (MFT) involves inferior turbinate bone removal +/- submucosal reduction, and has been highly effective at surgically treating inferior turbinate hypertrophy. This study's purpose was to determine the incidence of developing ENS6Q≥11 after MFT by comparing pre to postoperative ENS6Q scores.

Methods:
A retrospective cohort study was conducted on patients who underwent bilateral MFT +/- septoplasty to address nasal obstruction. Preoperative and postoperative nasal obstruction and septoplasty effectiveness (NOSE) and ENS6Q scores were recorded. Patients were followed for at least 12 months postoperatively.

Results:
Of 100 patients, median age was 52.5 years and 53% were male. Median follow-up was 20.0 months (range 12- 56 months). Patients underwent MFT with submucosal reduction in 70% of cases, while 30% had bone removal only, and 79% had septoplasty. NOSE scores decreased significantly postoperatively (median 45 point reduction, $p<0.0001$). Median pre- and postoperative ENS6Q were 8.0 and 2.0,

respectively, with a median 5 point decrease postoperatively (p<0.0001). While three patients had ENS6Q≥11 postoperatively (3%), only one developed ENS6Q≥11 postoperatively after having a preoperative ENS6Q<11 (1%).

Conclusions:
MFT +/- septoplasty led to significant long-term reduction in nasal obstruction, and 1% of patients developed an ENS6Q≥11 postoperatively after having a preoperative ENS6QQ<11.

1:07 pm – 1:13 pm
**Accuracy of the modified cotton test for ENS**
Lirit Levi, MD
Jayakar Nayak, MD, PHD
Michael T. Chang, MD
Angela Yang, BS
Esmond Tsai, BA
Stanford University

Introduction:
Diagnosis of empty nose syndrome (ENS) relies on both the presence of at least 3 of 6 major symptoms in the ENS 6-item questionnaire (ENS6Q) yielding a score of ≥11, as well as a 7-point reduction in ENS6Q score via cotton placement to the inferior meatus (IM), a 'positive' test. Our study aims to assess the accuracy and diagnostic reliability of ENS assessment using a graduated, modified cotton test.

Methods:
Patients diagnosed with ENS, based on the above criteria, participated in a blinded, 4-step, modified cotton test without use of topical anesthesia or decongestants. Conditions included: (1) Placebo/No cotton placed; (2) Complete cotton blockade; (3) Cotton against nasal septum; (4) Cotton in the IM. With each condition, patients completed an ENS6Q to assess nasal airway symptoms. Each score was compared against baseline (worst) and IM (best) scores.

Results:
48 ENS patients (56% male, mean age 48 years) were included. 83% had a positive cotton test with IM cotton placement (average ENS6Q reduction of 11.8 points). Complete cotton blockage had a 41% positive response (average reduction 6, p<.001), while cotton along the septum showed a 65% positive response (average reduction 10.2, p=.22). A placebo effect was also observed in 44%, however the score reductions from baseline were limited compared to IM cotton placement (delta 5.3 vs. delta 11.8 from baseline, p<.001).

Conclusions:
The 4-step modified cotton test provides further insight into subtleties of nasal breathing experienced by ENS patients. While most ENS patients prefer any intranasal cotton placement over baseline to limit nasal airflow, blinded testing reveals that these patients can accurately discriminate minimal changes in nasal aerodynamics.

1:14 pm – 1:20 pm
**Subtotal middle turbinate resection is unlikely to cause empty nose syndrome**
Jacob Eide, MD
Edward Kuan, MD, FARS
Nithin D. Adappa, MD, FARS
Satish Govindaraj, MD, FARS
Eunice Im
Tran Locke, MD
James N. Palmer, MD, FARS
Kevin Welch, MD, FARS
Bradford Woodworth, MD, FARS
Frederick Yoo, MD
John Craig, MD, FARS
Henry Ford Health

Background:
Empty Nose Syndrome (ENS) is a poorly understood, debilitating condition affecting a minority of patients who undergo turbinate surgery. The Empty Nose Syndrome 6-item Questionnaire (ENS6Q) was validated to diagnose ENS, with an ENS6Q≥11 being highly suggestive of ENS. A prior single-center study showed 2% of patients undergoing subtotal middle turbinate resection (sMTR) developing ENS6Q scores ≥11 postoperatively, but preoperative ENS6Q was not reported. The purpose of this multicenter study was to determine the incidence of patients developing ENS6Q≥11 following sMTR during endoscopic sinus surgery (ESS) for chronic rhinosinusitis with nasal polyps (CRSwNP) by comparing pre- and postoperative ENS6Q scores.

Methods:
A multi-institutional prospective cohort study (8 US institutions) was conducted on patients who underwent bilateral sMTR during ESS for CRSwNP. Pre- and postoperative ENS6Q scores were recorded. Patients were followed for at least 12 months postoperatively.

Results:
Of 110 patients, median age was 53.0 and 59.1% were male. Median follow-up was 13.4 months (range 12.1-22.3 months). Median pre- and postoperative ENS6Q were 7.5 and 2.0, respectively, and ENS6Q decreased significantly by a median 5.0 points postoperatively (p<0.0001). At time of last follow-up, no patient demonstrated an ENS6Q≥11. Of note, 19% of patients had preoperative ENS6Q scores ≥11, but all decreased to <11 postoperatively.

Conclusions:
Patients undergoing bilateral sMTR during ESS for CRSwNP never developed postoperative ENS6Q scores ≥11 during the first 1-2 years postoperatively.

1:21 pm – 1:27 pm
**Bovine derived collagen matrix in the treatment of empty nose syndrome**
Brian Cameron, MD
Martin Citardi, MD, FARS
University of Texas – Houston

Background:
The surgical management of empty nose syndrome consists of augmentation procedures using temporary injectables, rib cartilage grafts, xenografts and allografts. To date, there is no study looking at the use of bovine derived collagen matrix (BDCM) in this cohort. In this study, we analyze the use of BDCM in inferior meatus augmentation procedures (IMAP) in patients with empty nose syndrome.

Methods:
All patients who underwent IMAP between October 2020 and October 2023 were reviewed in a retrospective manner. Clinical and demographic data was collected. The response to treatment was assessed with the Empty Nose Syndrome 6 item Questionnaire (ENS6Q). Of the 22 patients who underwent IMAP, 14 had both preoperative and postoperative ENS6Q scores and were used for analysis.

Results:
Patients who underwent IMAP using BDCM had significant improvement in their overall ENS6Q scores (17.6 vs. 9.9, p = 0.0005). There were also significant improvements in 5 of the 6 questions on the ENS6Q: nasal dryness (p=0.01), sensation of diminished airflow (p=0.03), feelings of suffocation (p=0.008), the feeling of the nose being too open (p=0.002) and burning sensation (p=0.008). The remaining question (nasal crusting) was trending towards significance (p=0.06). There were no complications observed in any of these patients. 1 (4.5%) patient required a revision procedure and 2/22 (9.1%) had the procedure reversed.

Conclusions:
Patients with empty nose syndrome treated with IMAP using BDCM reported significantly improved symptoms as scored by the ENS-Q6. BDCM appears to be a viable material to use in IMAP and should be considered alongside previously established augmentation materials in the treatment of empty nose syndrome.

1:28 pm – 1:32 pm
**Q&A**

*Moderators: Kara Detwiller, MD, FARS; Jose Gurrola, MD*

1:33 pm – 1:39 pm
**Sniffing out trouble: Unmasking the dangers of VOCs on olfaction**
Margaret B. Mitchell, MD, MS-HPEd
Stella Lee, MD
Sophie Yu, Student
Simon Chiang, Research Assistant
Janaki Shah, MD
Mengyuan Ruan
Youn Soo Jung
Tanujit Dey
Bint-e Zainab Awa
Regan Bergmark, MD, FARS
Alice Maxfield, MD, FARS
Brigham and Women's Hospital

Background:
Volatile organic compounds (VOCs) are components of polluted air emitted from household devices, such as gas stoves. These have been linked to pulmonary pathology, but their effects on sinonasal health are less clear.

Objective:
To examine the relationships between urinary VOC concentrations and subjective and objective olfactory function and sinonasal symptoms.

Methods:
We utilized data from the 2013-2014 National Health and Nutrition Examination Survey (NHANES) which included urinary metabolites of VOCs studied (benzene, toluene, xylene, ethylbenzene), blood formaldehyde levels, and questions regarding olfaction and sinonasal symptoms as well as an 8-item validated objective olfaction test. We extracted demographic data and used logistic regression modeling to examine the relationship between individual urinary VOCs, olfaction scores, and sinonasal symptoms.

Results:
We identified a cohort of 732 patients (mean age 58 years, 52% female). Higher levels of urinary 3, 4-methylhippuric acid (3,4MHA), a metabolite of xylene, were associated with a reported diminished ability to smell since age 25 in unadjusted models (OR 1.04, 95% CI 1.01-1.07, p=0.006), and when adjusting for gas stove use (OR1.038 CI 1.01-1.07, p=0.013). Formaldehyde levels were associated with decreases in objective smell test scores (OR 0.79, 0.65-0.96, p=0.02).

Conclusion:
In our study, xylene appeared to be strongly related to poor long-term olfactory function, and formaldehyde to objective smell loss, but without any associated sinonasal symptoms. This suggests an alternative mechanism to olfactory loss than virally mediated olfactory dysfunction.

1:40 pm – 1:46 pm
**Evaluating olfactory function and quality of life in patients with traumatic brain injury**
Jennifer Willwock, MD
Amelia Lawrence, BS
Cole Bird, BS
Rahul Alapati, Research Fellow
Sarah Wagoner, BS
Antonio Bon-Nieves, BS
Robert Wright, Clinical Research Coordinator
Shah Jafri, BS
Kansas University Medical Center

Around 5.3 million Americans with traumatic brain injury (TBI) may experience olfactory dysfunction (OD), a condition yet to be linked to sino-nasal symptoms and olfactory quality of life (QoL). To address this gap, we evaluated both objective and subjective OD alongside QoL metrics in TBI patients (n=22), comparing them to a control cohort (n=22), all aged between 18-80. TBI patients sustained their injuries within 12 months prior to recruitment and did not exhibit OD beforehand. Participants completed sino-nasal (SNOT-22), olfaction quality of life (QoD-NS), cognitive and TBI symptom questionnaire (CSC), and an olfactory assessment (AROMA). Analyses included T-tests, Kruskal-Wallis, Chi-square, Pearson's and Spearman's ρ.

The TBI cohort had significantly worse AROMA ($p<0.001$), QoD ($p=0.001$), and SNOT-22 ($p=0.009$) scores, notably in the ear/facial ($p=0.002$), psychological ($p=0.010$), and sleep dysfunction ($p=0.030$) subdomains. Weak positive correlation existed between QoD and CSC ($\rho=0.375$), and very weak negative correlation between AROMA and QoD ($\rho=-0.169$).

In summary, TBI patients had significantly lower olfactory scores, correlating with diminished olfactory QoL, worse SNOT-22, and increased concussion symptoms. TBI-related anosmia is a common cause of acquired anosmia, yet not routinely tested. A comprehensive approach to TBI treatment should address OD's impact on QoL, sleep, and psychological well-being. A thorough and collaborative approach to TBI treatment, acknowledging the influence of OD, is a vital step towards enhancing the QoL for these patients.

1:47 pm – 1:53 pm
**Subjective vs objective olfactory assessment**
Aurelia S. Monk, BA
Shreyas Pyati
Meredith Meyer, Student
Nick Melott
Cristine Klatt-Cromwell, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
Adam Kimple, MD, PhD, FARS
Brent Senior, MD, FARS
University of North Carolina - Chapel Hill

Olfactory testing is divided between subjective testing, in which patients quantify their symptoms, and objective testing. Common subjective tests include the Odor Awareness Scale (OAS), Affective impact of Odor scale (AIO), and Vividness of Olfactory Imagery Questionnaire (VOIQ). The University of Pennsylvania Smell Identification Test (UPSIT) and Sniffin' Sticks are the most commonly used objective olfactory tests.

We aimed to assess concordance between subjective awareness using these questionnaires and objective olfaction.
Participants from a tertiary otolaryngology clinic completed the OAS, AIO, and VOIQ to measure subjective olfaction and the UPSIT to measure objective olfaction. Survey questions were adjusted to reflect a positive Likert scale, therefore higher total scores for each survey reflected better subjective sense of smell. Statistical analysis was conducted with Microsoft Excel and GraphPad Prism 10.

Twenty-five subjects completed testing. Based on UPSIT nomograms, 3 (12%) had normal sense of smell, 9 (36%) had mild microsmia, 2 (8%) had moderate microsmia, 6 (24%) had severe microsmia, and 5 (20%) had anosmia. Correlation coefficients between UPSIT scores, OAS, AIO, and VOIQ were 0.60, 0.60, and 0.11, respectively. ANOVA revealed significant differences in mean survey scores between severity groups for OAS ($p = 0.027$) and AIO ($p = 0.025$). Post-hoc analysis detected significance only between mild and anosmia groups for OAS ($p = 0.020$, 95% CI [4.84, 71.47]) and AIO ($p = 0.012$, 95% CI [2.919, 29.17]).

The relationship between subjective and objective olfaction varies in the literature. Our results demonstrate the OAS and AIO correlate with objective smell tests, differentiating between degrees of smell loss.

1:54 pm – 2:00 pm
**Age-related differences in olfactory retraining outcomes: A prospective cohort study**
Amelia Lawrence, BS
Jodi Veach, BS
Celina Virgen, Resident
Robert Wright, Clinical Research Coordinator
Shah Jafri, BS
Jennifer Villwock, MD
Kansas University Medical Center

As individuals age, olfactory function declines, but the impact of age on olfactory retraining (OT) outcomes is uncertain. This study compared a 6-month daily OT protocol in two cohorts: <50 years (younger cohort) and 51+ years (older cohort), aged 18 to 80, with olfactory dysfunction (OD). Of 56

participants (younger: 26, older: 30), olfactory function (AROMA), sino-nasal (SNOT-22), and OD quality of life (QoD-NS) assessments were conducted at baseline, 3 months, and 6 months.

Results showed both cohorts experienced significant improvement in AROMA scores (>16 points, max score 100) from baseline to 3 months (Younger Cohort: P=0.001; Older Cohort: P=0.008). The younger cohort showed significant improvements in QoD-NS (P=0.008) and SNOT-22 (P=0.042) between baseline and 3 months; the older cohort significantly improved from 3 to 6 months (QoD-NS: P=0.027, SNOT-22: P=0.049). Though no significant differences were observed in AROMA, QoD-NS, or overall SNOT-22 scores between the cohorts, the older cohort had worse extra-nasal symptoms at baseline (P=0.009), remaining significant at 3 months (P=0.043), but not at 6 months (P=0.087). Age did not affect retraining completion rates (P=0.210 at 3 months, P=0.378 at 6 months).

In conclusion, both cohorts demonstrated significant OD improvements from baseline to 3 months. While no significant differences were observed in AROMA scores from 3 to 6 months, the younger cohort showed notable improvements in QoD-NS and SNOT-22 scores from baseline to 3 months, whereas the older cohort demonstrated significant improvements from 3 to 6 months. This suggests age may influence subjective symptom relief during OT.

2:01 pm – 2:07 pm
**Efficacy of the nasal airflow-inducing maneuver in the olfactory rehabilitation of laryngectomy patients: A systematic review and meta-analysis**
Kurtis Young, MD
Frances Morden
Austin Johnson
Farrah Siddiqui , MD
Sameer Kejriwal
Hannah Bulosan
Elliott Koshi
Quinton Blount
Marianne Abouyared, MD
Jee-hong Kim, MD
University of Nevada, Las Vegas

Introduction:
This is the first systematic review and meta-analysis to investigate the effectiveness of the nasal airflow-inducing maneuver (NAIM) in olfactory rehabilitation for total laryngectomy (TL) patients.

Methods:
We conducted a systematic literature search following PRISMA guidelines. Inclusion criteria required that patients must have undergone a total laryngectomy with subsequent NAIM training of at least 2 weeks and olfactory evaluation. The impact of NAIM on olfactory outcomes compared to baseline was measured. Olfactory measures included the Sniffin' Sticks Test, Smell Disk Test, Scandinavian Odor Identification Test, and Quick Odor Detection Test. The primary outcome measure was the odds ratio (OR) of improvement in olfactory status from anosmia/hyponosmia to normosmia and anosmia to hyponosmia/normosmia.

Results:
Seven studies from 2000 and 2023, comprising a total of 290 TL patients met the inclusion criteria. The meta-analysis revealed that NAIM significantly improved the odds of TL patients achieving normosmia (OR = 7.55, 95% CI: 4.68 to 12.18, $p < 0.001$). Among the included patients, 88.3% were initially anosmic or hyponosmic, which was reduced to 48.9% after NAIM practice. Moreover, the odds of achieving hyposmia or normosmia versus anosmia after NAIM training was 9.63 (95% CI: 4.94 to 18.78, $p < 0.001$). NAIM demonstrated low heterogeneity and low risk for publication bias.

Conclusions:
NAIM proved effective in restoring olfactory function in TL patients, significantly enhancing their quality of life. NAIM stands out as a safe, easily teachable maneuver with promising results. Further effort is warranted to provide specific recommendations and guidelines for the use of NAIM in clinical practice.

2:08 pm – 2:12 pm
**Q&A**

*Moderators: Stella Lee, MD; Amber Luong, MD, PhD, FARS*

2:13 pm – 2:19 pm
**COVID-19 associated dysgeusia and olfactory dysfunction impact on nutrition and quality of life**
Hanna Moradi, BS
Amelia Lawrence, Research Fellow
Ellie Onstott, Medical Student
Celina Virgen, Resident
Robert Wright, Clinical Research Coordinator
Rahul Alapati, Research Fellow
Jennifer Villwock, MD
University of Kansas School of Medicine

Olfactory dysfunction (OD) and dysgeusia are recognized as COVID-19 consequences, yet their long-term impact on nutritional and psychosocial well-being have not been thoroughly investigated. To address this, we performed a prospective mixed-methods study examining quality of life (QoL) and nutritional outcomes in 60 participants (73.8% women; median age 66) with COVID-19-induced dysgeusia and OD. Participants underwent olfactory testing (AROMA), surveys (SNOT-22, QoD-NS, COVID-19 smell and taste impact questionnaire), and semi-structured phone interviews.
Most participants saw improvement in smell (63.9%), though not to their baseline levels (13.1%).

Improvement in taste was less common (36.5%). Participants with no improvement in smell began olfactory retraining on average 72.71 days later after symptom onset compared to those who improved, though this difference was not statistically significant (P= 0.20). Baseline AROMA score did not predict taste or smell improvement. Higher SNOT-22 scores correlated with aversion to vegetables (P= 0.017, Cramer's V= 0.412), and these individuals were more likely to express nutritional concerns (P= 0.028, Cramer's V= 0.283). Dysgeusia (45.9%) was the most problematic sensory issue, followed by OD (41.0%) and phantogeusia (9.8%). Safety concerns were commonly reported (83.3%), with 66.7% unable to detect smoke. 98% reported reduced QoL, and 64% altered their diet; only 18.0% had nutritional concerns and 35.0% reported weight loss.

Long-term sensory disturbances from COVID-19 universally reduced QoL. Dietary changes were common; nutritional concerns and weight loss were less frequent. Phone interviews stressed the need for patient support and targeted interventions for QoL and safety concerns.

2:20 pm – 2:26 pm

**Paxlovid is associated with lower rates of chronic post COVID-19 smell and taste disorders**

Esther Wang, BS
Zara Patel, MD, FARS
The University of Chicago

Introduction:
Millions continue to suffer from long-term smell and taste changes after COVID-19 infection. Despite advances in treating these symptoms, little research has been done on how clinicians can prevent progression to chronic post-COVID-19 olfactory and gustatory dysfunction.

Methods:
A retrospective chart review was performed at a tertiary medical center from Dec 2021 to June 2023 to identify patients who received paxlovid for acute COVID-19 infection and patients who did not receive paxlovid (matched by age). Occurrence of nasal congestion, rhinorrhea, and smell/taste loss were recorded both in the acute (<30 days for nasal congestion, rhinorrhea; <90 days for smell/taste loss) and the chronic settings for both groups.

Results:
707 individuals had complete data (paxlovid: 405, non-paxlovid: 302). Mean age was 57.5 in the paxlovid group and 61.9 in the non-paxlovid group. Significantly more individuals in the paxlovid group experienced nasal congestion (p=0.002) and rhinorrhea (p<0.001) in the acute setting. However, individuals who took paxlovid were less likely to have either symptom continue after 30 days (p=0.073 and p=0.944, respectively).

In the acute setting, there was no significant difference between groups in the number of patients experiencing olfactory and/or gustatory changes (p=0.373). After taking paxlovid however, individuals were less likely to experience chronic olfactory/ gustatory changes (p=0.024).

Conclusion:
Intervention with paxlovid may decrease the risk of chronic post-COVID-19 smell/taste changes. Instead of solely prescribing paxlovid to prevent severe pulmonary and cardiac symptoms of COVID-19 infection, we should consider its use in preventing long-term smell and taste loss as well.

2:27 pm – 2:33 pm

**Corticosteroid responsive olfactory dysfunction in CRS: What does it mean?**

Kaete Archer, MD
Vijay Ramakrishnan, MD, FARS
Indiana University

Background:
Olfactory dysfunction is a cardinal symptom in chronic rhinosinusitis (CRS). In the setting of CRS, olfactory improvement with corticosteroids suggests reversibility and preserved function, while a lack of response suggests irreversibility. Our goal is to investigate if self-reported pre-operative corticosteroid-responsive olfactory dysfunction (CROD) is a predictor of post-operative olfactory improvement in patients with CRS undergoing sinus surgery.

Methods:
We performed a prospective, observational study of patients with refractory CRS and pre-operative olfactory dysfunction undergoing sinus surgery. Patients were characterized into corticosteroid-responsive and non-corticosteroid-responsive based on a survey response. Patient outcome measures were recorded pre- and post-operatively.

Results:
A total of 190 study participants were included. Patients with CROD were more likely to have comorbid nasal polyposis (p=0.002), asthma (p=0.12), and aspirin sensitivity (p<0.001). Patients with non-CROD were more likely to have a history of sinus surgery (p=0.008), history of tobacco use (p=0.019), and GERD (p=0.036). Patients with CROD had significantly better post-operative OCES total scores (p=0.011), Sniffin' Sticks identification scores (p=0.048), and QOD-NS total scores (p=0.033).

Conclusion:
In conclusion, patients with CRS and CROD are more likely to have a greater improvement in olfactory dysfunction post-operatively by objective and subjective measures. This suggests that corticosteroid responsiveness is a clinical predictor of

preserved function and reversibility and can be used as a simple clinical prognostic factor in the shared decision making for surgery and setting post-operative expectations.

2:34 pm – 2:40 pm
**Topography of odorant specific recognition: Preliminary investigation into an olfactory map**
Harish Dharmarajan, MD
Jess Mace, MPH, CCRP;
Zachary Soler, MD, FARS
Kara Detwiller, MD, FARS
Mathew Geltzeiler, MD, FAR
Rodney Schlosser, MD, FARS
Timothy Smith, MD, MPH, FARS
OHSU

Background:
Establishing the presence of a human olfactory topographic map may allow clinicians to distinguish the etiology of olfactory loss (e.g., inflammatory vs neurogenic) based on unique patterns of identification and discrimination and/or olfactory cleft disease.

Methods:
Patients with nasal polyposis (n=81) were prospectively enrolled across five tertiary academic centers and completed baseline Sniffin' Stick testing. Sinus CT images were analyzed for average opacification (%) in anterior, middle, and posterior regions of the olfactory cleft (OC). Odorant specific identification and discrimination compounds were characterized with respect to opacification of different OC regions.

Results:
Greater anterior (82.9% v 61.7%, p<0.001) and middle OC opacification (84.2% v 67.8%, p<0.010) was associated with incorrect identification of fish odorant (tri-methylamine) with no significant difference in average posterior OC opacification. There was significance only with greater middle OC but not anterior and posterior OC opacification in patients who misidentified coffee (Furaneol; 83.1% v 68.8%, p< 0.050) and clove (Eugenol; 84.9% v 69.4%, p<0.010). There was significantly greater (p<0.05) anterior OC opacification on average in patients unable to discriminate the following odorants: Octylacetate (79.0% v 65.4%), n-Butanol (78.4% v 65.0%), 2-Phenylethanol (80.4% v 67.0%), and (-)-Carvone (77.2% v 59.4%).

Conclusions:
Inflammatory disease in the anterior and middle OC appears to have more impact on olfactory identification and discrimination in comparison to posterior OC disease. Understanding the patterns of olfactory dysfunction in a topographic manner may help to distinguish disease etiology or guide treatment focus.

2:40 pm – 2:45 pm
**Q&A**

2:45 pm – 3:15 pm
**Break with Exhibitors**

3:15 pm – 3:30 pm
**Targeted Discussions and Debates: Alternative Therapies for Smell Loss**
Moderator: Kristine Smith, MD
Panelists: Joshua Levy, MD, FARS; Zara Patel, MD, FARS

*Moderators: Toby Steele, MD; William Yao, MD, FARS*

3:31 pm – 3:37 pm
**Twelve-month outcomes of septal swell body reduction using temperature-controlled radiofrequency**
Jordan Pritikin, MD, FARS
Stacey Silvers, MD, FARS
Jeffrey Rosenbloom, MD
Bryan Davis
Anthony Del Signore MD, FARS
Ahmad Sedaghat, MD
Bobby Tajudeen, MD, FARS
Isaac Schmale, MD
Rakesh Chandra, MD, FARS
Chicago Nasal & Sinus Center

Background:
Nasal airway obstruction (NAO) is a highly prevalent disorder retricting normal airflow within the nasal cavity. Septal Swell Body (SSB) hypertrophy is recognized as an important but often overlooked contributor to NAO. This study assessed the durability of effect of temperature-controlled radiofrequency (TCRF) treatment of the SSB for NAO.

Methods:
This prospective, multicenter study enrolled patients with severe/extreme NAO due to SSB hypertrophy with demonstrated reduction in SSB and NAO symptoms following application of topical decongestant prior to treatment. Patients had bilateral TCRF SSB treatment in one treatment session. No other anatomic sites or follow-up treatments were allowed. Nasal Obstruction Symptoms Evaluation (NOSE) Scale, Sino-nasal Outcome Test (SNOT-22), Numerical Rating Scale (NRS) – ease of breathing, and patient satisfaction were assessed at baseline (pre-treatment) and at 3, 6, and 12 months post-treatment.

Results:
Of the 70 patients treated, 68, 65 and 62 completed the 3, 6, and 12-month follow-up assessments. The mean NOSE score was reduced from 73.5 at baseline to 27.6, 23.9, and 25.4 at 3, 6, and 12

months, respectively (p<.001). Mean SNOT-22 scores were reduced from a baseline of 48.8 to 18.5, 18.9, and 19.1 at 3, 6, and 12 months, respectively (p<.001). This represents a 65.4% reduction in NOSE score and 60.9% reduction in SNOT-22 at 12 months. Similarly, there was a 62.5% improvement in ease of breathing at 12 months (p<.0001). Mean patient satisfaction with the procedure was 4.3/5.0 (SD 0.8) at 12-months.

Conclusion:
This study demonstrates TCRF SSB treatment provides durable improvements in symptoms of NAO through 12 months with high patient satisfaction.

3:38 pm – 3:44 pm
**Posterior nasal nerve surgical neurectomy versus ablation for chronic rhinitis**
Sainiteesh Maddineni
Peter Hwang, MD, FARS
Zara Patel, MD, FARS
Jayakar Nayak, MD, PhD
Michael T. Chang, MD
Stanford University

Background:
Surgical neurectomy of the posterior nasal nerve (PNN) for chronic rhinitis (CR) does not currently have well-characterized outcomes compared to PNN ablation techniques (cryoablation, radiofrequency ablation). We compare outcomes of PNN surgical neurectomy vs ablation.

Methods:
We retrospectively reviewed all patients with CR at our center 2014-2023 who received PNN ablation or surgical neurectomy without concurrent sinus surgery. To assess outcomes, we compared scores of the SNOT-22 rhinologic subdomain (SNOT-22R) and individual SNOT-22 items of rhinorrhea and post-nasal drip.

Results:
50 patients were studied (mean age 58.6 yrs; 34% allergic, 52% nonallergic, 14% mixed rhinitis), 34 had PNN ablation, 23 had surgical neurectomy, and 7 had both. Mean follow-up time was 216 ± 341 days. SNOT-22R improved significantly for both ablation (16.8 ± 6.0 to 13.4 ± 7.1, p=0.047) and neurectomy (18.9 to 14.7 ± 5.7, p=0.019). There was no difference in the mean magnitude of SNOT-22R improvement between neurectomy and ablation (-4.2 ± 6.6 vs -3.4 ± 7.2, p=0.699). However, neurectomy had significant reductions in individual items of rhinorrhea (3.3 ± 1.6 to 2.2 ± 1.5, p=0.024) and post-nasal drip (4.2 ± 1.3 to 2.9 ± 1.6, p=0.005), while ablation did not (p>0.05 for both). Patients with a prior history of ablation who then underwent neurectomy (n=7) did not have significant improvement in rhinorrhea (3.4 ± 1.5 to 3.0 ± 1.3, p=0.579), post-nasal drip (4.3 ± 1.0 to 3.3 ± 1.5, p=0.161), or SNOT-22R (19.7 ± 6.2 to 16.9 ± 6.0, p=0.397) after neurectomy.

Conclusion:
Both PNN ablation and surgical neurectomy have significant improvements in rhinologic symptoms. Neurectomy may have a greater effect on rhinorrhea and postnasal drip.

3:45 pm – 3:51 pm
**Nasal obstruction outcomes in chronic topical nasal decongestant use patients**
Anthony Di Ponio, DO
Mohammad-Nadim Samad, Dr.
Richard Pellizzari, Medical Student
Hussein Mackie
Robert Deeb, Dr.
John Craig, MD, FARS
Henry Ford Health

Background:
Topical nasal decongestants (TNDs) are used to reduce nasal soft tissue edema and obstruction. However, with chronic TND use (CTNDU), as the TND effect fades, patients can develop rebound nasal edema and obstruction. Management of CTNDU has centered largely on TND cessation +/- intranasal or oral corticosteroids. The purpose of this study was to compare nasal obstruction outcomes following nasal obstruction surgery in patients with versus without CTNDU.

Methods:
A retrospective cohort study was conducted with adult patients who underwent bilateral inferior turbinate reduction with or without septoplasty and nasal valve repair. Patients with versus without CTNDU were assessed. CTNDU was defined as 3 or more uses weekly for at least 4 weeks. Pre- and postoperative Nasal Obstruction Symptom Evaluation (NOSE) scores, and TND use at time of last follow-up were collected. NOSE score changes were compared between patients with versus without CTNDU.

Results:
Of the 32 CTNDU patients, mean age was 51 years, and 31.3% were female. Of 117 non-TND users, mean age was 41.2 years, and 53.0% were female. Postoperative NOSE scores were collected at a mean 35.4 ± 19.2 months postoperatively for CTNDU patients, and 6.0 ± 4.3 months for non-TND users. Mean NOSE score reductions were 9.6 ± 7.4 for CTNDU patients (p<0.0001), and 9.1 ± 5.8 for non-TND users (p<0.0001). The NOSE score reductions were not significant between the two cohorts (p=0.502). Long-term TND cessation was maintained in 78.1% of CTNDU patients.

Conclusion:
Patients with and without CTNDU achieved similar long-term significant NOSE score reductions following nasal obstruction surgery. Additionally, about 80% of CTND users maintained long-term TND cessation.

3:52 pm – 3:58 pm
**Mouth breathing correction reduces exercise-induced bronchoconstriction in adults and children**
Yusuf M. Gulleth, MD
Peter Catalano, MD, FARS
Ayham Alkarmi, Dr.
St. Elizabeth's Medical Center

Introduction:
The premise of this study is that treating nasal obstruction and conversion from mouth breathing to nasal breathing will reduce or eliminate the symptoms of exercise-induced bronchospasm(EIB) in the majority of patients.

Methods:
This is a prospective, single arm, non-blinded study involving 50 patients aged 7-64 years with sino-nasal symptoms who mouth breath and also had symptoms of EIB. All patients underwent nasal surgery to include septoplasty, bilateral inferior turbinate reduction, uncinectomy, anterior ethmoidectomy, nasal swell body reduction and adenoidectomy as indicated. Pre and 3-month post surgery symptom scores were obtained using NOSE and SNOT-22 scores for Sino-nasal symptoms and Mini Asthma Quality of Life Questionnaire (Mini-AQLQ) and Exercise-Induced Bronchoconstriction Survey (EIBS) for EIB symptoms scores. The primary outcome measure is the change in the symptom scores of the 4 questionnaires after nasal surgery. Secondary outcome measure is the correlation between the sino-nasal outcome scores and EIB symptom scores. Wilcoxon signed rank test and Pearson correlation tests were used.

Results:
50 patients completed the surveys; 27 male, 23 female, ages 8-59 (Mean 28 SD 14.0). There is a statistically significant improvement in all 4 metrics after nasal surgery: EIBS ($p< 0.001$), Mini AQLQ ($p< 0.001$), SNOT-22 ($p< 0.001$)and NOSE ($p< 0.001$). Pearson Correlation testing indicated a statistically significant positive correlation of symptom improvement on EIBS and Mini AQLQ scores with the SNOT-22 and NOSE scores.

Conclusions:
Surgical correction of mouth breathing can reduce and/or eliminate EIB in all ages.There is significant correlation between mouth breathing due to nasal obstruction and EIB.

3:59 pm – 4:05 pm
**Impact of posture and CPAP therapy on nasal airflow partitioning**
Ahmad Hamdan, Medical Student
Sarin Rungmanee
Nithita Sattaratpaijit
Nader Shammout
B. Tucker Woodso
Guilherme Garcia
Medical College of Wisconsin

Continuous positive airway pressure (CPAP) for obstructive sleep apnea (OSA) is associated with complaints of nasal dryness and nasal congestion following use. Few studies to date investigated the impact of CPAP on objective measures of nasal airflow. The goal of the present study was to investigate the impact of posture and CPAP therapy on objective measures of nasal airflow. A cohort of 36 OSA patients underwent rhinomanometry to measure unilateral airflow at a 75 Pa pressure drop. Measurements were performed in awake patients sitting, after patients laid supine for 10 minutes, and supine acutely following 10 minutes of CPAP at 10 cmH2O. The most obstructed side (MOS) and least obstructed side (LOS) were defined as the nasal cavities with the smallest and highest unilateral airflows, respectively, in the sitting position. Airflow partitioning was defined as unilateral airflow as a percentage of bilateral flow. Statistical significance was tested with the Wilcoxon signed rank test at the level $p < 0.05$. Bilateral airflow was not significantly affected by posture (478 mL/s sitting, 419 mL/s supine, $p = 0.07$) or CPAP therapy (419 mL/s pre-CPAP, 425 mL/s post-CPAP, $p = 0.85$). Unilateral airflow decreased from sitting to supine in the LOS (298 mL/s to 214 mL/s, $p = 0.002$), while airflow in the MOS was not affected by posture (179 mL/s sitting vs. 205 mL/s supine, $p = 0.24$). CPAP had no impact on unilateral airflows after acute withdrawal. Airflow partitioning was affected by posture (62% sitting to 51% supine in the LOS, $p = 0.001$). Our results suggest that airflow partitioning becomes more symmetric when patients change from sitting to supine, while CPAP therapy has no effect on nasal airflow in the short time interval investigated.

4:06 pm – 4:12 pm
**Q&A**

4:13 pm – 5:00 pm
**Panel: The Nasal Valve: Selecting Patients for Minimally Invasive v. Open Procedures**
Moderator: William Yao, MD, FARS
Panelists: Henry Barham, MD, FARS; Monica Patadia, MD; Douglas Sidle, MD; Brent Senior, MD, FARS; David Yen, MD

5:00 pm – 5:05 pm
**Q&A**

5:05 pm
**Meeting Adjourns**

## ARS Poster Viewing
## Wednesday, May 15, 2023
## 1:00 pm - 7:00 pm

## Thursday, May 16, 2023
## 9:00 am - 7:00 pm
## Riverside Exhibit Hall

## ARS Combined Poster Reception
## Thursday, May 16, 2024
## 5:30 pm – 7:00 pm
## Riverside Exhibit Hall

Poster #C001
**FAERS olfactory adverse events**
Daniel Lofgren, DO
Katrina Minutello, DO
Eriel Emmer
Christopher Lenkeit, DO
Olga Santiago, PhD
Asha Downs, DO
McLaren Oakland Hospital

Objectives:
Olfactory dysfunction has gained considerable interest with its association with the coronavirus pandemic. Due to the limited literature on olfactory-related adverse events (ORAEs) associated with medications, this study investigated ORAEs reported in the Food and Drug Administration Adverse Event Reporting System (FAERS) with the goal of identifying the most frequent medications associated with these reactions.

Study Design:
Cross-sectional analysis

Setting:
FAERS Database

Methods:
The FAERS database was accessed to obtain ORAEs from 2012 to 2022. Disproportionality analysis was conducted by calculating the Proportional Reporting Ratios (PRR) and Reporting Odds Ratio (ROR) for anosmia, parosmia, hyposmia, and olfactory dysfunction. A PRR > 2 or ROR > 1 was significant.

Results:
Our final study population consisted of 1111 cases with the following symptoms: anosmia (672), parosmia (364), hyposmia (71), and olfactory dysfunction (4). The most significant ROR signal scores were found for secukinumab (3.42; 95% CI [1.9, 4.01]) for anosmia, levofloxacin (8.86; 95% CI [2.83, 9.8]) for hyposmia, and pregabalin (6.88; 95% CI [2.23, 8.01]) for parosmia. No significant PRR signal scores were found for anosmia, but significant signals were found for citalopram hydrobromide (17.25; 95% CI [17.01, 17.49]) in hyposmia, and dimethyl fumarate (3.18; 95% CI [3.09, 3.27]) in parosmia. No valid PRR or ROR values were found for olfactory dysfunction.

Conclusions:
Pharmacovigilance studies provide an opportunity to evaluate the safety profile of medications in regard to ORAE, particularly for those commonly prescribed for sinonasal symptoms. Findings from this study may function as a resource for prescribers and patients.

Poster #C002

**24 hour antibiotic prophylaxis regimen is effective in ESBS**

Ashleigh Halderman, MD, FARS
Kennedy Harris
Gabriel Andino
Shirley Marino Lee
Ellen Wang
Sei Chung, MD
University of Texas Southwestern

Introduction:
The optimal prophylactic antibiotic regimen for patients undergoing endoscopic skull base surgery (ESBS) has not been defined and guidelines are lacking. Since 2016, our practice is to initiate intravenous antibiotics intraoperatively and treat for a total of 24 hours. The goal of this study was to evaluate the effectiveness of our current perioperative antibiotic prophylaxis regimen.

Methods:
Data were collected retrospectively and prospectively on patients undergoing ESBS of the sellar region between the years 2008-2023 on variables including patient demographics, perioperative use of antibiotics, post-operative course, complications, and readmissions. Continuous variables were analyzed with the student t-test whereas categorical variables were analyzed with a Chi-square analysis.

Results:
192 patients were analyzed. The most common antibiotic given was cefazolin (80%), followed by vancomycin (6%), clindamycin (3.1%) and vancomycin with clindamycin or cefepime (2.6%). The median number of days on antibiotics was 1 and median number of doses was 4. The rates of intraoperative CSF leak, post-operative CSF leak, and post-operative meningitis were 46%, 10%, and 2.6%. Interestingly, 4/5 patients who developed meningitis were treated with vancomycin perioperatively versus 1/5 treated with cefazolin which was significant ($p<0.0001$). No adverse events or allergic reactions attributed to antibiotics were identified.

Conclusions:
Treatment with 24 hours of antibiotics, specifically cefazolin appears to be effective in preventing post-operative infections in patients undergoing ESBS. Vancomycin alone may not be the most effective choice for prophylaxis but further evaluation is needed.

Poster #C003

**30 day readmissions after endoscopic pituitary surgery**

Ashleigh Halderman, MD, FARS
Shirley Marino Lee
Kennedy Harris
Gabriel Andino
Ellen Wang
Sei Chung, MD
University of Texas Southwestern

Introduction:
The literature on 30-day readmissions following endoscopic skull base surgery is limited. The aim of this study was to evaluate factors contributing to and causes for readmission after endoscopic skull base surgery for sellar pathology.

Methods:
Patients who underwent endoscopic skull base surgery for pituitary adenoma or Rathke's cleft cyst (RCC) between 2016-2022 were retrospectively reviewed. Data were collected on demographics, tumor specific information, surgical factors, post-operative course, and readmissions. Continuous variables were analyzed with the student t-test whereas categorical variables were analyzed with Chi-square analysis.

Results:
200 patients were analyzed. The overall readmission rate for the cohort was 8.5% (n=17). The mean day of readmission was post-operative day 10.3. Patients who underwent readmission were more likely to have an intraoperative CSF leak during the initial surgery ($p=0.02$). There was no difference between the groups for grade of CSF leak. The most common reason for readmission was CSF leak (7/17) followed by hyponatremia (6/17). Patients with hyponatremia underwent readmission significantly earlier than those with CSF leaks (post-operative day 7 versus 14.8, $p=0.02$, 95% CI: 1.06 to 14.6). Length of stay during the readmission was significantly longer for patients with CSF leak versus all others (8.2 vs 3.3, $p=0.01$, 95% CI=0.97 to 8.8).

Conclusion:
CSF leaks and hyponatremia were the most common reasons for readmission after endoscopic endonasal surgery for pituitary adenomas or RCC's. Interestingly, patients with hyponatremia were readmitted earlier than those with CSF leaks and patients readmitted with CSF leak had significantly longer readmission stays.

Poster #C004

**A retrospective analysis of office-based rhinologic procedures**

Sarah Zahabi, MD
Andrew Kokavec, Medical Student
Taciano Rocha, Research Associate
Leigh Sowerby, MD
Brian Rotenberg, MD, FARS
Western University

Background:
Office-based rhinologic procedures (OBRP) have become more widely available in North America due to technological advances, improved equipment, refinement of technique, and appropriate patient selection. Nevertheless, the literature exploring the safety of these procedures remains limited. The objective of this study was to further evaluate the safety and tolerability as well as the wait-times of these procedures with a more robust sample size.

Methods:
A retrospective chart review of all patients who underwent OBRP from May 2015 to March 2023. Information regarding patient demographics, the indication for surgery, wait time, tolerability, intra- and postoperative complications, need for revisions, and type of revision (if applicable) was recorded.

Results:
1226 patients underwent OBRP during the study period. These included turbinoplasties (35%), endoscopic sinus surgeries (ESS) (26%), septoplasties (14%), nasal fracture reductions (7%), and other procedures such as external nasal valve rhinoplasties (18%). For ESS procedures, the anterior ethmoids and the maxillary sinuses were the most common sinuses treated. 1.1% of procedures required termination. The post-operative complication rate was 3.1%, with 2 of them (0.16%) being major complications (significant bleeding and sepsis). The average wait time was 4.16 months (SD 3.6), and the mean follow-up time was 11 months (SD 16.9).

Conclusion:
Office-based rhinologic procedures are well tolerated and safe for the appropriate patient and associated with shorter wait-times, low revision rates as well as avoidance of general anesthesia. The complication rates are similar to previously reported rates for rhinologic surgeries done in the operating room.

Poster #C005

**A scoping review of female sex hormones' influence on airway inflammation at the cellular level**

Anthony Dick, MD, MPH
Snehitha Talugula, Medical Student
Victoria Lee, MD, FARS
Margaret Chervinko, MFA, MLIS
University of Illinois at Chicago

Background:
The significance of sex hormones in disease processes are increasingly being recognized, in particular their influence on immune response in inflammatory diseases. This scoping review explores the existing literature in translational science, on the effects of female sex hormones on asthma and sinonasal inflammation in animal studies.

Methods:
PubMed and Embase were searched, using the terms "Estrogen," "Progesterone," "Female," "Sinonasal disease", and similar terms. Only English-language articles examining the role of female sex hormones in airway inflammation were included. Data was collected on the study model, sample size, method of hormonal exposure, cellular events, and immune responses.

Results:
Ten studies met the inclusion criteria, 3 in rhinitis and 7 in asthma animal models. Inflammatory responses, including expression of various inflammatory mediators and population of immune cells, were assessed in the context of exposure to female sex hormones or their receptor modulators. All but 2 studies reported reduced inflammatory response with higher exposure to estrogen or estrogen receptor agonists through a range of cellular mechanisms. One study found increased inflammatory response in mice with steady-state estradiol compared to ovariectomized mice with no supplementary estrogen. Another study found that female mice exhibited stronger immune responses but did not attribute this specifically to estrogen.

Conclusions:
This review highlights the potential of female sex hormones, primarily estrogen, in modulating immune responses in asthma and sinonasal diseases. Further research, however, is needed to fully understand the intricacies of these hormonal interactions and the implications.

Poster #C006

**A systematic review of patient frailty and endoscopic endonasal skull base surgery outcomes**

Sofia Olsson, BS
Ashleigh Halderman, MD, FARS
Matthew Ryan, MD, FARS
Bradley Marple, MD
Sei Chung, MD
Anne Burnett Marion School of Medicine

Background:
Frailty is defined as a range of multisystem impairments which occur independent of natural senescence. It can be quantified in various ways, such as the modified frailty index (mFI), which considers patient comorbidities. In many surgical fields, it has become increasingly apparent that frailty better predicts clinical outcomes than age alone. However, within endoscopic endonasal skull base surgery (EESBS), the role of frailty as a prognosticator for complications, morbidity, and mortality is uncertain.

Methods:
A systematic review of frailty and EESBS was conducted using PubMed, Cochrane Library, Ovid Medline, Web of Science, Embase, and Google Scholar. The search yielded 408 publications which reduced to 38 following removal of duplicates and non-English articles, and after screening relevancy by title. Two researchers independently reviewed each abstract and 13 articles remained. After full article review, 5 specifically examined frailty within EESBS (such as transsphenoidal approaches for sellar and suprasellar masses and CSF leak repair).

Results:
The included articles all examined the predictive value of frailty based on validated scales. Apart from 1 article, there was a pooled consensus that increased frailty was associated with longer postoperative hospital stays, readmission rates, complications, and total hospital charges. There was no association between frailty and mortality.

Conclusions:
Frailty appears to predict multiple outcomes after EESBS. Assessing frailty preoperatively may better prepare the surgeon in counseling the patient regarding the surgery and postoperative expectations.

Poster #C007

**ADI does not predict CSF leak risk in pituitary adenoma resection**

Tyler Merrill, MD
Jakub Jarmula
Alan Gordillo
Troy Woodard, MD, FARS
Varun Kshettry, Assistant Professor of Neurological Surgery
Pablo F. Recinos, Associate Professor of Neurological Surgery
Raj Sindwani, MD, FARS
Cleveland Clinic

Introduction:
Social determinants of health are gaining greater recognition in endoscopic skull base surgery (ESBS). The Area Deprivation Index (ADI) is a new metric of socioeconomic status, however, it has not been investigated within intraoperative outcomes, including cerebrospinal fluid (CSF) leak. The primary outcome of this study was to measure the association between patient ADI score and CSF leak occurrence.

Methods:
This was a retrospective cohort study of adult patients who underwent ESBS with both a neurosurgeon and rhinologist at our institution between January, 2017 – December, 2018 and had a histologically-confirmed diagnosis of pituitary adenoma. Only patients undergoing definitive treatment were included. A multivariable logistic regression model of CSF leak development was created.

Results:
Over a two-year period, 123 patients were included, with 61 (49.6%) cases of an intraoperative CSF leak. There were no significant demographic differences between groups (e.g., age, insurance type, body mass index). The ADI was not predictive of CSF leak (median ADI score 66 with CSF leak versus 61 without CSF leak, p=0.26). In a logistic regression model, expanded surgical approaches were significantly associated with CSF leak occurrence when controlled for maximal tumor size, ADI score, and BMI (odds ratio 6.14, 95% CI: 1.51-25.03, p=0.01). No other factors were significant.

Conclusions:
Socioeconomic status may reflect underlying differences in health status and influence clinical outcomes. In this study, the ADI did not predict intraoperative CSF leak occurrence in patients undergoing ESBS for pituitary adenoma resection.

Poster #C008

**ADI does not predict readmissions after endoscopic skull base surgery**

Jakub Jarmula, BA
Alan Gordillo
Tyler Merrill
Troy Woodard, MD, FARS
Varun Kshettry, Assistant Professor of Neurological Surgery
Pablo F. Recinos, Associate Professor of Neurological Surgery
Raj Sindwani, MD, FARS
Cleveland Clinic Foundation

Introduction:
Readmissions are an important metric of quality of care. However, no studies have investigated the role of patient socioeconomic status, such as the Area Deprivation Index (ADI), in predicting 30-day readmissions after endoscopic skull base surgery (ESBS). The objective of this study was to measure the effect of ADI on 30-day readmission likelihood.

Methods:
This was a retrospective cohort study of adult patients who underwent ESBS via a two-surgeon approach for a variety of pathologies at our institution between January, 2017 – December, 2019. Only patients undergoing definitive treatment were included. The probability of a readmission within 30 days of discharge was calculated using a multivariable logistic regression model.

Results:
A total of 288 patients were included. The most common pathologies managed were pituitary adenoma (n=180, 62.5%), meningioma (n=16, 5.6%), and craniopharyngioma (n=13, 4.5%). Twenty-eight patients (9.7%) were readmitted within 30 days of discharge after ESBS. There were no significant differences in medical comorbidities nor socioeconomic characteristics. The ADI did not predict readmission. Readmitted patients had a significantly lower median body mass index (27.4 versus 31.6, p=0.002). There were no significant differences in clinical characteristics, such as pathology type. In a logistic regression model, only BMI was found to be a significant predictor of 30-day readmission (odds ratio=0.91, 95% CI: 0.85-0.98, p=0.01).

Conclusions:
This study was the first to measure the predictive ability of the ADI for 30-day readmissions following ESBS. The ADI was not predictive of readmissions. Decreased BMI was associated with higher risk of readmission when adjusted for age and ADI.

Poster #C009

**Adjunctive dupilumab treatment after surgery in CRSwNP**

Yi-Tsen Lin, MD, PhD
Chin-Nung Liu, Dr.
Chih-Feng Lin, Dr.
Te-Huei Yeh, Prof.
National Taiwan University Hospital

Introduction:
Chronic rhinosinusitis with nasal polyps (CRSwNP), particularly the type 2 inflammatory subtype, is often associated with a high recurrence rate following endoscopic sinus surgery (ESS). While dupilumab has been shown to be a promising treatment for CRSwNP, its role as an adjunctive therapy after surgery remains unclear. This study sought to evaluate the efficacy of postoperative treatment with dupilumab.

Method:
We conducted a retrospective comparative study of type 2 CRSwNP patients. Patients receiving dupilumab in the perioperative period were included, while the control group consisted of subjects who underwent ESS and received standard care. Changes in the Lund-Kennedy endoscopic scores (LKES) and nasal polyp recurrence were collected, and linear mixed models were used for the primary outcome analysis.

Results:
The study enrolled 45 CRSwNP patients, with 23 patients in the dupilumab group. Postoperative LKES decreased in both dupilumab and control groups. The linear mixed model showed that LKES remain unchanged over time after sinus surgery in the dupilumab group (coefficient = -0.08, 95% CI = -0.63 to 0.48, P = 0.718), while LKES significantly increased over time in the control group (coefficient = 0.12, 95% CI = 0.03 to 0.20, P = 0.008). There was no dose-response relationship between LKES and number of dupilumab treatments (coefficient = 0.124, 95% CI = -0.282 to 0.531, P = 0.351).

Conclusion:
Postoperative LKES remained unchanged over time in CRSwNP patients who received dupilumab after ESS. This suggests that dupilumab may be a beneficial treatment option for CRSwNP patients in conjunction with surgical intervention.

Poster #C010

**AERD treatment outcomes improve more rapidly with institutional experience**

Jennifer Douglas, MD
Si Hao Tang
Ashika Mani
Michael A. Kohanski, MD
James N. Palmer, MD, FARS
Nithin D. Adappa, MD, FARS
John V. Bosso, MD
University of Pennsylvania

Background:
Aspirin-exacerbated respiratory disease (AERD) is characterized by chronic rhinosinusitis with polyps, asthma, and sensitivity to aspirin. Successful management requires close coordination of surgery and aspirin desensitization (AD). We sought to investigate whether greater institutional experience produced improved treatment outcomes.

Methods:
A retrospective review was performed of AERD patients undergoing surgery and AD at a single quaternary academic medical center. Patients completing treatment in the first (early) versus most recent 3 years (late cohort) following creation of a multidisciplinary AERD Center were compared. Demographics, extent of surgery, SNOT-22 scores, and need for revision surgery were compared using Wilcoxon rank sum tests.

Results:
196 and 120 patients underwent treatment in the early and late cohorts, respectively. Patients undergoing AD in the late cohort were on average younger (49.7 vs 54.7 years; $p = 0.002$) compared with the early cohort. There was no significant difference in sex between cohorts. SNOT-22 scores were significantly improved in the late cohort at the pre-AD ($\Delta$-10.9, $p = 8e-8$) and 2-3 months post-AD ($\Delta$-6.9, $p = 0.009$) time points compared with the early cohort. There was no significant difference in scores at 4-6, 7-12, 13-24, or 24-36-months post-AD or in the extent of frontal surgery and need for revision surgery between cohorts.

Conclusions:
A single center approach to the management of AERD facilitates quicker improvement in sinonasal outcomes, emphasizing the importance of a close, collaborative relationship between rhinologist and allergist in the treatment of AERD.

Poster #C011

**AI vs web-based sinus surgery patient education material**

Anu Sharma, BS
Mohamad Chaaban, MD, FARS

Background:
We aim to compare the accessibility of patient-facing information on sinus surgery provided by generative Artificial Intelligence (AI) models, Google, and online institutional resources.

Methods:
Questions covering 5 domains of sinus surgery information (overview, indications, preparation, complications, and post-operative care) were inputted into 2 AI models (ChatGPT and Bard) and Google. Responses were compared to the corresponding information found on Cleveland Clinic (CCF) and Johns Hopkins University (JHU) websites. Google and AI models were queried for advice on 5 postoperative concerns: clear nasal drainage, fever, bleeding, vision loss, and headache. Patient Education Materials Assessment Tool (PEMAT) was used to assess source understandability and actionability. Readability was assessed using Flesch-Kincaid Reading Ease Scores. Kruskal-Wallis testing was used to determine significance.

Results:
There was no significant difference in PEMAT scores among the 5 sources, though the CCF source had highest average understandability (88.3%), and Google had highest average actionability (56.6%). ChatGPT responses had the lowest readability ($p=0.03$), consistently at the college level or above across all domains, with Bard presenting information at the lowest reading level. ChatGPT had the lowest actionability for urgent concerns, for example, not providing a timeframe or temperature above which one should seek medical care for postoperative fever.

Conclusion:
ChatGPT had the lowest understandability, actionability and reading ease scores and poor ability to respond to urgent postoperative concerns. Our study demonstrates significant limitations among generative AI in presenting information on sinus surgery.

Poster #C012

**AI vs. residents: ChatGPT versions in otolaryngology exams**

Evan Patel, MS
Lindsay Fleischer
Bobby Tajudeen, MD, FARS

Background:
Advances in deep learning and artificial intelligence (AI) have led to the emergence of large language models (LLM) like ChatGPT from OpenAI. The objective of this study was to assess how ChatGPT 3.5 and GPT4 would perform on Otolaryngology (Rhinology) Standardized Board Examination questions in comparison to Otolaryngology residents.

Methods:
This study selected all 127 Rhinology standardized questions available on www.boardvitals.com, a commonly used study tool by otolaryngology residents to prepare for board exams. 34 image-based questions were excluded, resulting in 93 questions administered with raw score and recorded. Questions were given to ChatGPT 3.5 and to GPT4. The LLM's answer results were compared with the average results of the specific questions utilized within the question bank (used primarily by otolaryngology residents). Based on the findings of an earlier study, a pass-fail cutoff was set at the 10th percentile.

Results:
ChatGPT 3.5 answered correctly 45.2% (42 of 93) of the time (8th percentile). In contrast, GPT4 showcased a higher accuracy rate, answering correctly 86.0% (80 of 93) of the time (66th percentile). The average percent correct by www.boardvitals.com users was 76.3%. Using the 10th percentile as a benchmark for a passing score, projections suggest that ChatGPT 3.5 might not pass the American Board of Otolaryngology Written Qualifying Exam (ABOto WQE), whereas GPT4 stands a very strong chance of passing.

Conclusion:
The older LLM, ChatGPT 3.5, is unlikely to pass the otolaryngology board exam. However, the advanced GPT4 model exhibits a much higher likelihood of success. This rapid progression in AI indicates its potential future role in otolaryngology education.

Poster #C013

**An analysis of ChatGPT recommendations to current guidelines in adult sinusitis**

Shaun Edalati, BS
Vikram Vasan, Mr.
Sunder Gidumal
Satish Govindaraj, MD, FARS
Alfred Marc Iloreta, MD

Background:
Adult Sinusitis is a common respiratory illness that places a significant burden on the public healthcare system. Globally, position papers and national ARS recommendations have been released with the goal of defining diagnostic standards and outlining available treatments. Thanks to the development and use of chatbot models like ChatGPT, there are now additional opportunities for exchanging information and giving guidance in the field of healthcare, especially when it comes to sinusitis management.

Objective:
To compare the guidelines offered by the American Academy of Otolaryngology—Head and Neck Surgery Foundation (AAO-HNS) on adult sinusitis to Chat GPT-4 responses.

Methods:
ChatGPT is a widely used and open large language model–based chatbot developed by OpenAI. Institutional review board approval was not necessary for this study. Each recommendation or guideline was preceded by a set of questions. On September 19, 2023, the answers were obtained from Chat-GPT-4. To avoid bias from previous responses, each question received its own window.

Results:
A total of 12 guidelines consisting of 30 questions from the AAO-HNS were compared to ChatGPT-4 responses. Among the 30 questions, 24 (80%) were accurate, one (3.3%) was over-conclusive, 21 (70%) included supplemental data, and 10 (33.3%) were incomplete.

Conclusion:
We found that ChatGPT was reasonably accurate at responding to common questions about adult rhinosinusitis when compared to the AAO-HNS clinical guidelines. In addition, more work needs to be done befo

Poster #C014

**An analysis of treatment experiences in the prolactinoma subreddit**

Rose Dimitroyannis, BA
David Fenton, Medical Student
Sharanya Thodupunoori
Stella Cho, Medical Student
Christopher Roxbury, MD, FARS

With improvement in complication and remission rates, recent studies have suggested the viability of transsphenoidal surgery as first-line management for prolactinomas. Reddit, an online forum, allows posters to interact with one another, discuss symptoms, treatments, and disease courses through specialized forums known as “subreddits”. Given the lack of research comparing patient experience on pharmacotherapy vs surgery, we sought to assess the sentiment of treatment within the “Prolactinoma Subreddit” community.

A search was done filtering the Prolactinoma Subreddit. Posts were sorted by “top” of “all time,” meaning entries with the most engagement throughout the site’s history. Welch’s t-test was used to analyze treatment type, while sentiment regarding treatment was analyzed using grounded theory qualitative methods.
From 189 total entries, 82 were included; 33% (n=27/82) were posts. Of posters disclosing their treatment, 11% underwent surgery (n=9/79), while 76% received medication (n=60/79). Of posters receiving medication that disclosed type, 90% (n=61/68) received cabergoline, while 9% (n=6/68) received bromocriptine. The proportion of positive: negative sentiment and level of engagement on posts regarding pharmacotherapy vs surgical treatments were not significantly different ($p>0.05$).

Overwhelmingly, posters on the prolactinoma subreddit received medical treatment, primarily cabergoline, showing a preference among doctors or patients. Though there were fewer surgery posts, they were as positive in sentiment and received as much interaction as medical posts. Future studies thematically studying patient experiences may provide further insight into the viability of first-line surgical management for prolactinomas.

Poster #C015

**An unusual case of nasal chondromesenchymal hamartoma**

Stefano Millarelli
Antonella Loperfido, MD
Francesca Romana Millarelli, MD
Gianluca Bellocchi, MD
San Camillo Forlanini Hospital, Rome, Italy

Nasal Chondromesenchymal Hamartoma (NCMH) is a rare tumour of the sinonasal tract with a benign clinical behaviour. Locally destructive symptoms may occur. Due to the extreme rarity of this entity, only a few case reports are present in literature and most of them describe paediatric patients, usually under 12 years. Occasionally it may occur in adults.Symptoms are usually due to nasal localization, as nasal obstruction or local compression caused by the lesion itself, as visual disturbances or facial pain. Cases described in adults are exceedingly rare.

We report a case of an 87-year-old man referred to the Otolaryngology Department after the occasional finding of an asymptomatic nasal septal lesion. The lesion was incidentally highlighted at a CT head scan requested after initial geriatric assessment to evaluate the onset of an essential tremor. The exam revealed a solid neoformation, 47x37x28 mm in size, with a calcific component, destructive in nature, localized at the level of the nasal cavities and septum with extension to the sinus cavities. The ENT evaluation with flexible nasal endoscopy showed a mass most likely generating from the nasal septum with extension to the posterior ethmoid; the lesion was covered with normal mucosa and extended to both nasal cavities causing a subtotal obstruction of the nasal passages. Multiple biopsy samples for histological typing were obtained and the histological diagnosis was NCMH.

The  decision was a wait-and-see approach. After six months from the diagnosis, the patient is following the regular follow-up. The patient is currently asymptomatic. The treatment of choice should be radical surgical resection; decisions must also be made in relation to the frailty of the elderly.

Poster #C016

**Anatomical factors addressed during contemporaneous revision sinus surgery for chronic pansinusitis**

Nitish Kumar, MS
Devyani Lal, MD, FARS
Mayo Clinic

Background/Aim:
Contemporary surgery to address diffuse chronic rhinosinusitis (CRS) relies on wide-hole sinusotomies with incorporation of natural ostia along with comprehensive ethmoid dissection. We studied anatomical features noted in patients undergoing contemporaneous revision ESS for panCRS.

Methods:
With IRB approval, the electronic health database was searched to identify adults undergoing full house bilateral revision ESS between 2019 to September 2023. Preoperative CT scans and operative records were reviewed to record data on anatomical factors needing revision.

Results:
Eighty subjects met inclusion criteria. When studied by patients, residual uncinate tissue was found in 55% (44/80), non-incorporated natural ostia in 42.5% (34/80) of maxillary antrostomies, residual anterior ethmoidal septations in 66.25% (53/80), residual posterior ethmoidal septations in 71.25% (57/80), inadequate sphenoid sinusotomy in 76.25% (57/80) and incomplete frontal outflow track dissection in 77.5% (62/80).When reviewing by sinuses, non-incorporated natural ostia were seen in 37.5% (60/160) of antrostomies. Residual septations was seen in 64.37 % (103/160) of anterior ethmoids and 75% (120/160) of posterior ethmoids. Inadequate sphenoid sinusotomy was noted in 68.12% (109/160) sides, and incomplete clearance of the outflow track in 73.75% (118/160) of frontal sinuses.

Conclusion:
We noted significant prevalence of anatomical factors that limited success of prior ESS. These findings are not dissimilar to those reported since the 1990s, although knowledge of CRS pathogenesis and optimal technique has greatly evolved. Further study of factors influencing these findings is needed, especially in the contemporary era of biologic therapies.

Poster #C017

**Ancient history of nasal reconstruction: The origins of beauty and the impact on global surgery**

Jonathan Deck, BS
Mia Lauter, BS

In the history of mankind, nothing has been more desired and displayed than beauty. More inexplicably, no price has ever been considered too high to attain it. The purpose of this study is to investigate the past and challenging conditions in global surgery especially in areas where rhinoplasty is not an option and dramatically improve quality of life for patients all over the world. To begin, the story of cosmetic surgery begins with nasal reconstruction, or rhinoplasty, as the nose is the prominent feature on the human face, and its appearance can decide the relative facial beauty of the person. According to the latest annual statistics from the American Society of Plastic Surgeons, more than 200,000 cosmetic nasal surgery procedures were performed. Several countries in Asia are among the top international destinations of choice for cosmetic surgery. Setting the tone from KPOP to soap operas to facial plastic surgery, South Korea particularly boasts the highest number of cosmetic procedures per capita and even offers tax breaks to tourists interested in going 'under the knife'. But, how did rhinoplasty evolve and become one of the most popular 21st century cosmetic procedures? Earlier studies using SPY-Q software considered a more extensive analysis on ancient designs including the forehead flap but not much research exists in effort to increase awareness and improve accessibility of modern designs like Doppler Ultrasonographic Anatomy of the Midline Nasal Dorsum. Exploring rhinoplasty's ancient past may effectively change the modern clinical practice of rhinoplasty, gain deeper appreciation for the field's historical roots, and foster improved accessibility and cultural sensitivity in modern facial plastic surgery.

Poster #C018
**Anosmia by SARS-CoV-2 strain**
Shreya Mandloi, BS
Alexander Duffy, MD
Elliott Sina
Chase Kahn, MD
Peter Benedict, MD
Samuel R. Shing
Zachary Urdang, PhD, MD
Elina Toskala, MD, PhD, FARS
Marc Rosen, MD, FARS
Mindy Rabinowitz, MD, FARS
Gurston Nyquist, MD, FARS

Background:
The Omicron variant of COVID-19 has been shown to cause lower rates of anosmia than previous COVID-19 strains. No prior study has investigated the most recent COVID-19 variants, Arcturus and Eris, on anosmia risk. This study evaluates trends in anosmia across COVID-19 variants.

Methods:
The TriNetX Database was queried for COVID-19 patients. Cohorts were created based on date of diagnoses to capture the different surges of variants (Alpha, Delta, Omicron, Arcturus, and Eris). Anosmia risk was analyzed from 1 week–3 years following diagnosis across different variants.

Results:
3,133,890 patients with COVID-19 were queried. 897,151 had the Alpha variant, 571,578 had the Delta variant, 1,426,626 had the Omicron variant, 1167,279 had the Arcturus variant, and 71,256 had the Eris variant. Anosmia risk decreased from the Alpha (0.55%) and Delta (0.52%) variants to the Omicron (0.19%), Arcturus (0.09%) and Eris (0.06%) variants. Anosmia odds were significantly decreased following the Arcturus variant versus the Alpha variant (OR:4.26;p<0.0001). 4,060,704 unvaccinated patients diagnosed with COVID-19 were compared to 505,587 vaccinated patients diagnosed with COVID-19 and no significant differences in the odds of anosmia were observed(OR:0.96;p=0.12).

Discussion:
This study reveals a decreasing rate in the diagnosis of anosmia with progressive variants. Understanding the trends of anosmia across variants is useful for patient education and may allow us to better understand the pathogenesis of COVID anosmia across the different mutations.

Poster #C019
**Approach to Intracranial Internal carotid artery pseudoaneurysm rupture**
Smile Kajal, MD
Hitesh Verma, Dr.
Akaber Halawi, Dr.

Introduction:
Massive epistaxis due to rupture of Intracranial Internal carotid artery (ICA) pseudoaneurysm is rarely encountered in Otolaryngology emergency but when it does, it requires immediate action.

Objective:
To provide an update for approach towards diagnosis and management of patients with ruptured intracranial ICA pseudoaneurysm from an otolaryngologist perspective.

Methods and Materials:
The PubMed library was searched for published literature related to intracranial ICA pseudoaneurysm, a narrative review was formulated, and a stepwise approach was proposed to manage these cases.

Results:
Nasal bleeds that are massive and have a history of preceding sino-nasal surgical intervention or head trauma must raise suspicion and require probing for bleeding from ICA. The classic triad of unilateral blindness, orbital fractures/head injury, and massive epistaxis is almost pathognomonic for ICA pseudoaneurysm. Digital subtraction angiography remains the gold standard for the diagnosis. Currently, endovascular interventions such as stenting and/or coiling remain the standard of care for such patients. However, if advanced interventional neuro-radiology units are not available immediately, an otolaryngologist must take actions to stabilise the patient, order investigations timely, and control the bleeding with measures like packing of nose/ sphenoid sinus with ribbon gauze or crushed muscle tissue, or ligation of carotid in extreme cases.

Conclusion:
Rupture of ICA pseudoaneurysm requires collaboration of Emergency team, Otolaryngologist, Interventional Neuro-radiologist, Anaesthetist, and Vascular surgeon to ensure timely management of such patients. The stepwise approach suggested here can act as a guide for managing such cases.

Poster #C020

**Area deprivation index scores do not predict delay to Draf III procedures**

Murray Bartho, BS
Jess Mace, MPH CCRP
Mathew Geltzeiler, MD, FARS
Vivek Pandrangi, MD
Oregon Health & Science University

Background:
Patients with chronic rhinosinusitis (CRS) refractory to endoscopic sinus surgery (ESS) may require the Draf III procedures. This study evaluated if socioeconomic status (SES) measured by area deprivation index (ADI) scores is associated with number of surgeries prior to Draf III procedures among patients with CRS.

Methods:
A retrospective chart review was conducted of adult CRS patients residing in Oregon or Washington who underwent Draf III procedures at Oregon Health & Science University between December 2012 and February 2022. Patient zip codes were used to calculate national and state ADI values. Complete Sino-nasal Outcome Test-22 (SNOT-22) scores were recorded.

Results:
A total of 115 patients were identified for final analyses. Most patients were male (60.0%) with a mean age at time of Draf III procedure of 55.6 years (range 22-83 years). The mean time between Draf III and last sinus procedure was 6.0 [±7.5] years. Comparing subjects with ≤ 2 previous sinus procedures (n=76) and > 2 previous sinus procedures (n=39), no significant differences were found between mean state (5.6 [± 2.6] vs 5.3 [± 2.7]; p=0.53) or national (35.8 [± 18.5] vs. 33.2 [± 18.6]; p=0.47) ADI values. No statistically significant differences in mean number of previous ESS between state and national ADI categories were found (p>0.05). There were no differences in mean SNOT-22 scores between state (p=0.64) or national (p=0.42) ADI categories.

Conclusions:
Neighborhood disadvantage measured using ADI scores does not appear to predict the number of ESS operations prior to Draf III procedures in this cohort and may not predict higher preoperative disease severity. Further research into the effects of SES and ADI on CRS is warranted.

Poster #C021

**Assessing the efficacy of a customized 3D-printed septal prothesis based on the NOSE-perf score**

Pedro Lanca Gomes, MD
Stephen Bansberg, MD
Amar Miglani, MD
Mayo Clinic – Arizona

Background:
3D-printed customized septal prothesis (3D-PCSP) is a conservative treatment option for large nasal septal perforations. Symptom outcomes using a validated patient recorded outcome measure (PROM) following button placement are lacking. The objective of this study was to assess the efficacy of 3D-PCSP using the NOSE-Perf score PROM.

Methods:
A retrospective review between 2018-2023 was performed of patients with nasal septal perforation patients who received a 3D-PCSP. The change in pre- and post-procedure NPS was used as the primary endpoint, which was analyzed through a paired samples T-test. Descriptive statistics was utilized to present the data on perforation size (length and height), etiology, follow-up duration, procedure duration, pre-operative NPS, post-operative NPS, and NPS change. Age distribution, gender, and the American Society of Anesthesiology (ASA) classification were also described.

Results:
Twelve patients were included in this review with mean (± SD) of ***. Mean (± SD) perforation height and length measured 17.9 (± 5.8) mm and 24.2 (± 11.1) mm, respectively. Mean baseline preoperative NOSE-Perf(± SD) was 19.53 (±7.18) and this decreased to 9.38 (± 5.37) following 3D-PCSP placement (p = 0.0011). The mean follow-up (± SD) was 19.0 (± 6.26) months.

Conclusions:
3D-PCSP improves patient reported outcome measures for large nasal septal perforations, demonstrated by the NOSE-Perf score Further prospective and comparative studies are needed to better assess predictors of success using 3D-PCSP and to understand the comparative efficacy of different treatment options.

Poster #C022

**Association of prior nose surgery with olfactory function among older adults**

Khamis Suleiman
Richard Chiu, BS
Sharmilee Nyenhuis, Associate Professor of Pediatrics and Medicine
Kamal Eldeirawi, Associate Professor of Epidemiology
Victoria Lee, MD, FARS
University of Illinois College of Medicine Chicago

Background:
Olfactory dysfunction (OD) is a prevalent condition that often presents in the older adult population. Various factors have been shown to contribute to OD, such as neurodegenerative disease, older age, and smoking; however, the influence of nose surgery on OD remains incompletely understood with inconsistent findings in the literature. This study seeks to explore the potential effect of nose surgery on olfactory function.

Methods:
This cross-sectional study was conducted on data for 2285 adults from Round 1 of the National Social Life, Health, and Aging Project (NSHAP). Normal olfaction was defined as correctly identifying 4 odors in the 5 item Sniffin' Sticks test and OD was defined as 0–3 odors identified. Association between prior nasal surgery and olfactory function was assessed using multivariable logistic regression and adjusted odds ratios (OR) were calculated. Analyses incorporated NSHAP-provided weights to account for sampling design.

Results:
OD was present in 18.4% of adults. The average age was 67.1 ± 7.2 years among those with normal olfaction and 70.9 ± 7.9 years for those with OD. Among patients with normal olfaction, 8.1% had prior nasal surgery, compared to 9.8% of patients with OD. After adjusting for age, gender, race, education, prior stroke, dementia, and self-reported mental health, prior nasal surgery was not associated with OD (OR: 1.14; 95% CI: 0.51–1.17).

Conclusion:
While this study provides insight into the relationship between nose surgery and OD, it was limited by its cross-sectional design and the lack of data on the specific surgery that participants underwent. Therefore, additional research with detailed information on the types of surgeries would further elucidate this relationship.

Poster #C023

**Baseline characteristics of AROMA study CRSwNP patients by number of surgeries**

Jay Pinto, MD
David W Jang, MD, FARS
Joseph K. Han, MD, FARS
James W. Mims, MD
Shigeharu Fujieda, Professor
Thomas Plucinak, Dr.
Lucia De Prado Gomez, Dr.
Mark Corbett, Dr.
Scott Nash, Dr.
Juby A. Jacob-Nara, Dr.
Harry Sacks, MD
University of Chicago

Background:
Sinonasal surgery is considered for patients with chronic rhinosinusitis with nasal polyps (CRSwNP) refractory to medical therapy. Characteristics of patients with CRSwNP starting dupilumab who have undergone one or more sinonasal surgeries are unknown in the real-world setting.

Methods:
AROMA (NCT04959448) is a prospective global registry study recruiting adults with CRSwNP initiating dupilumab and following them for up to 36 months. Baseline assessments include demographics, disease burden, and history of prior sinonasal surgery.

Results:
As of February 2023, AROMA had recruited 303 patients, (n=116 no prior surgery; n=118 one prior surgery; n=69 two or more prior surgeries). The proportion of patients reporting previous oral corticosteroid (OCS) use per group was 62.9%, 70.3%, and 75.4%, respectively, and the proportions reporting antibiotic use were 43.1%, 45.8%, and 47.8%, in the last 24 months respectively. The proportion of patients regularly seeing an otolaryngologist was 52.6%, 46.6%, and 63.8% respectively.

Conclusion:
In patients with CRSwNP initiating dupilumab treatment, an increasing number of prior surgeries was associated with higher rates of OCS and antibiotic use. Patients reporting two or more surgeries were most likely to regularly see an otolaryngologist.

Poster #C024

**Baseline characteristics of CRSwNP patients by surgical history in AROMA study**

Jay Pinto, MD
David W. Jang, MD, FARS
Joseph K. Han, MD, FARS
James W. Mims, MD
Shigeharu Fujieda, Professor
Thomas Plucinak, Dr.
Lucia De Prado Gomez, Dr.
Mark Corbett, Dr.
Scott Nash, Dr.
Juby A. Jacob-Nara, Dr.
Harry Sacks, MD
University of Chicago

Background:
Chronic rhinosinusitis with nasal polyps (CRSwNP) is associated with high symptom burden and significantly impaired health-related quality of life. Sinonasal surgery is considered for patients with CRSwNP refractory to medical therapy.

Methods:
AROMA (NCT04959448) is a prospective global registry study recruiting adults with CRSwNP initiating dupilumab and following them for up to 36 months. Baseline assessments include demographics, disease burden, and history of prior sinonasal surgery.

Results:
As of February 2023, AROMA had recruited 303 patients, including 187 with prior sinonasal surgery and 116 without. Patients with a history of prior surgery were more likely to be male (55.1% vs 40.5%) and report previous oral corticosteroid use (72.2% vs 62.9%) than surgery-naïve patients. Post-surgical patients visited otolaryngologists at similar rates to those who were surgery naïve (52.9% vs 52.6%) and suffered from similar burden of coexisting asthma (69.8% vs 71.1%) but were less likely to visit an allergist (36.9% vs 66.4%). Global Patient Assessment scores were higher/worse for post-surgical patients versus surgery naïve (35.3% vs 25.9% moderate; 31.0% vs 27.6% severe).

Conclusion:
Patients starting dupilumab for CRSwNP in AROMA were more likely to have prior surgery and rate their CRSwNP symptoms as moderate or severe.

Poster #C025

**Bimodal neurosensory stimulation by olfactory training with visual stimulation**

Supinda Chusakul, MD
Napat Lertweerasirikul
Jesada Kanjanaumporn
Nattida Chotechuang
Songklot Aeumjaturapat, MD
Kornkiat Snidvongs, MD, PhD
Kachorn Seresirikachorn
Chulalongkorn University

Background:
There is some evidence that demonstrates visual input enhances olfactory perception. This study aimed to investigate the efficacy of olfactory training (OT) and whether bimodal neurosensory stimuli with visual input concordant with olfactory stimuli can improve the efficacy of OT in neurosensory olfactory losses.

Methods:
This was a single-blinded, randomized, controlled trial. 23 neurosensory olfactory loss patients were randomized to either OT with visual stimulation or OT only. TDI scores were assessed at the baseline, 1st, and 4th months after OT.

Results:
A total of 20 patients completed the study. TDI scores of all subjects were significantly improved in 1st month ($p < 0.001$, 95%CI 2.30 to 5.82) and in the 4th month ($p = 0.035$, 95%CI 0.18 to 4.67). Six patients from 20 patients (30%) showed significant clinically improved changes in olfactory function from baseline. The improvement of VAS of sense of smell in all subjects was significantly shown after olfactory training in the 1 st month ($p < 0.001$, 95%CI 0.81 to 1.96) and in the 4th month ($P= 0.001$, 95%CI 0.84 to 2.92). When comparing the two groups, there were no significant differences in the mean difference of TDI scores in 1st month ($p = 0.997$, 95% CI -3.67 to 3.66) and 4th month ($p = 0.145$, 95% CI -4.53 to 3.51). There were no significant differences in the mean difference of the VAS of sense of smell in 1st month ($p = 0.714$, 95%CI - 0.99 to 1.42) and in 4th month ($p = 0.013$, 95% CI -3.97 to 0.55) when comparing between two groups.

Conclusion:
OT can improve the sense of smell in some patients with refractory
neurosensory smell loss. We cannot demonstrate the enhancement effects of neurosensory stimulation with visual input while performing OT.

Poster #C026

**Biologic therapy and CRSsNP endoscopic sinus surgery rates**

Kevin Herrera, BS
Jason Chwa
Kevin Hur, MD
Keck School of Medicine of USC

Objectives:
To investigate how biologic therapy effects endoscopic sinus surgery (ESS) rates for chronic rhinosinusitis without nasal polyposis (CRSsNP).

Study Design:
Retrospective Cohort

Methods:
Using the TriNetX US collaborative database, patients 18 years or older with a CRSsNP diagnosis were retrospectively followed for 5 years. The cohort was stratified into patients with and without a prescription for biologic therapy. The biological agents included were Omalizumab, Dupilumab, and Mepolizumab. Only patients who initiated a biologic agent after diagnosis of CRSsNP were included. The cohort was further stratified into no prior ESS, prior history of ESS, and by individual biologic agent. Groups were matched by age, sex, race, ethnicity, and history of asthma. Outcomes included first-time ESS and revision ESS. Measures of association and Kaplan-Meier estimates were calculated.

Results:
Of the 18,006 patients without prior ESS, a majority were Female (71.1%) with an average age of 52.8+/-15.6 years, and had a history of asthma (71.3%). Omalizumab was the most common agent (42.9%), followed by Dupilumab (37.3%) and Mepolizumab (19.8%). After 5 years the biologic group showed no significant difference in first-time ESS risk [OR: 1.00; 95%CI:(0.80-1.24)]. Similar results were seen during subgroup analysis for Omalizumab [OR: 1.20; 95%CI:(0.90-1.59), Dupilumab [OR: 0.71; 95%CI:(0.501-1.01)], and Mepolizumab [OR: 0.84; 95%CI:(0.54-1.30)]. Among the 2,116 patients with prior ESS, initiation of a biologic did not reduce risk of revision ESS [OR 1.05; 95%CI:(0.56-1.97)].

Conclusion:
The currently available biologics to treat CRS are not associated with a reduction of first-time ESS or revision ESS rates.

Poster #C027

**Case of bilateral concurrent sinonasal pleomorphic adenoma and glomangiopericytoma**

Chappel Pettit
Keonho Kong, MD
Luke Driskill, Resident
University of Mississippi Medical Center

Background:
Pleomorphic adenomas (PA) are the most common benign tumors of major salivary glands but rarely occur in the nasal cavity. PA has no definitive etiology and is characterized as an encapsulated, well-defined mass with epithelial and mesenchymal differentiation. Glomangiopericytomas (GPC) are mesenchymal tumors that are a variant, but distinct from hemangiopericytomas. GPC have a less invasive nature and lower malignant potential than the former, and account for less than 0.5% of all sinonasal tumors. There is a dearth of data on GPCs in the medical literature and no reports of concurrent presentation with nasal pleomorphic adenoma.

Methods:
We present a case of concurrent bilateral sinonasal pleomorphic adenoma and glomangiopericytoma.

Results:
A 68-year-old female presented with a left caudal septal pleomorphic adenoma. CT scan and MR revealed, in addition to the left anterior PA, a mass in the superior meatus of the right nasal cavity. The patient underwent endoscopic excision of both masses. The right sinonasal mass seemed to originate from the posterior nasal septum in the sphenoethmoid recess. Clean margins were obtained. Final pathology confirmed pleomorphic adenoma for left caudal septal mass but returned glomangiopericytoma for right septal mass. Two months post-surgery, no evidence of recurrence of either tumor was found.

Conclusion:
Pleomorphic adenomas and glomangiopericytomas are both rare sinonasal tumors that differ greatly in origin and histologic features. Recommended treatment for both entities is currently complete surgical excision. This case signifies the first report to our knowledge of the simultaneous presentation of a sinonasal polymorphic adenoma and glomangiopericytoma.

Poster #C028

**Characterizing donor susceptibility to EBV infection in the nasopharynx using organotypic rafts**

Shwet Kitchloo
Kathy Shair, Assistant Professor
Eric Wang, MD, FARS
Joshua Walston, Postdoctoral Candidate
Japan Patel, Bioinformatician
Alan Backerholm, Bioinformatician
University of Pittsburgh School of Medicine

Background:
Epstein-Barr virus (EBV) infects humans, with nearly 95% seropositivity in adults. The etiology of EBV-associated nasopharyngeal carcinoma (NPC) is thought to be multifactorial, however all EBV-associated NPCs harbor a latent and clonal EBV infection. Thus, control of EBV molecular pathogenesis during establishment and maintenance of latency is important in the progenitor NPC cell. Historically, EBV infection has been difficult to study because conventional 2D cell culture models do not capture the diversity of cell types that exist in the nasopharynx. Our hypotheses are that 3D nasopharyngeal organotypic rafts can support EBV de novo infection, that across multiple donors cryopreserved conditionally reprogrammed cells (CRCs) can be thawed and differentiated, and that these organotypic rafts can be used to identify host genes encoding EBV restriction factors.

Methods:
We established a 3D nasopharyngeal culture to model EBV de novo infection using organotypic rafts. Our cultures are grown from primary nasopharyngeal CRCs, collected from consenting adults undergoing skull-base surgery with no known nasopharyngeal co-pathology. Our nasopharyngeal cryobank consists of 31 donors.

Results:
We have developed an immunostaining molecular diagnostic panel to identify latent- or lytically- infected cells. Additionally, we have optimized single cell RNA-sequencing analyses to profile the spectrum of EBV genes expressed among different cell types.

Conclusions:
3D nasopharyngeal organotypic rafts can both support EBV infection and model potential EBV-induced mechanisms towards the formation of NPC. Further investigations in the variation in susceptibility to de novo EBV infection among different cell types and donors are ongoing.

Poster #C029

**ChatGPT antibiotic stewardship**

Nick Melott
Aurelia S. Monk, BS
Shreyas Pyati
Scott Hardison, MD
Matthew Lelegren, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
Cristine Klatt-Cromwell, MD
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS

Objective:
Rhinosinusitis is one of the most common reasons for a physician visit and affects an estimated 12-15% of the U.S. population annually. Despite international guidelines for classification and management of acute rhinosinusitis, it has one of the highest rates of inappropriate antibiotic usages. ChatGPT, a popular artificial intelligence language learning model, has gained popularity in the field of medicine and researchers, clinicians, and patients are coming to terms with how it will impact clinical care. We hypothesized that ChatGPT, when prompted with variations of a patient history of acute viral rhinosinusitis, would recommend antibiotics less often than the historical national average of ambulatory care visits.

Methods:
ChatGPT was prompted to act as a physician to determine the simulated patients' diagnosis and provide the most appropriate treatment. We presented ChatGPT with 10 different patient scenarios for acute viral rhinosinusitis, each varying in presenting symptoms, symptom duration, and categorization of symptoms from mild to moderate. Each presented scenario of viral rhinosinusitis should not be an indication for antibiotics, based on current guidelines.

Results:
In the 10 presented scenarios of acute viral rhinosinusitis, ChatGPT recommended antibiotic treatment twice (20%), conservative measures 5 times (50%), and provided an indeterminate response 3 times (30%).

Conclusions:
Overall, ChatGPT prescribed antibiotics inappropriately 5% less than the national average across all age groups. Our findings suggest that ChatGPT may be a useful clinical aid for physicians in adhering to the guidelines for sinusitis and reducing the number of inappropriate antibiotic prescriptions.

Poster #C030

**Chronic granulomatous IFS with intracranial extension causing vision loss**

Kue Lee, BS
Abdullah Chandasir
Victoria N. Huynh
Ishan Aggarwal
Camillo Reyes, MD, FARS

Introduction:
Chronic granulomatous invasive fungal sinusitis (CGIFS) is a rare, slow-growing form of invasive fungal sinusitis that presents with focal neurologic deficit, headache, cranial nerve palsy, and nasal symptoms. Here, we present two unique cases of varying profiles.

Study Design:
Case Report with Literature Review

Results:
Case 1 involved a 33-year-old woman with history of chronic nasal congestion who underwent a craniotomy due to worsening vision and suspected meningioma. Biopsy results revealed non-necrotizing granulomatous inflammation caused by aspergillus. She was referred to ENT and was diagnosed with CRSwNP, requiring left middle meatal antrostomy with excision, bilateral endoscopic total ethmoidectomies, and bilateral endoscopic sphenoidotomies. Patient experienced 2 seizures post-op due to suspected frontal lobe injury from craniotomy.

Case 2 involved a 69-year-old male presenting with headaches and left central vision loss. Imaging showed optic nerve compression from sinus mass, requiring FESS and temporal craniotomy for biopsy. Sinus cultures grew Pseudomonas aeruginosa, treated with IV cefepime, vancomycin, and metronidazole. Recurrent headaches and brain abscesses required additional craniotomy for abscess drainage and pain management a month after initial procedures. Cultures in revisional craniotomy revealed Aspergillus, leading to diagnosis of granulomatous invasive fungal sinusitis. The patient was put on Voriconazole and is doing well post-op.

Conclusion:
CGIFS, a rare form of IFS, mostly affects immunocompetent individuals, presenting with unilateral proptosis caused by Aspergillus. This report presents some unique cases, highlighting their presentation in lack of immunocompromised

Poster #C031

**Chronic rhinosinusitis incidence before and during COVID-19 pandemic: A retrospective cohort study**

Jen Li Dong, BS
Sameer Sidiq
Sunthosh Sivam, Dr.
Tran Locke, MD
Meha Fox, MD

Introduction:
While most people recover from COVID-19 infection within a week, some have symptoms months after the acute phase of infection known as “post-COVID-19.” The proposed cause of post-COVID-19 is persistent immune dysregulation. Chronic rhinosinusitis (CRS), an inflammatory sinonasal disease, has not been studied in relation to COVID-19. This study explores CRS incidence before and during the COVID-19 pandemic.

Methods:
We conducted a retrospective cohort study of the All of Us Database. Our cohort included adults diagnosed with CRS from 1/1/18 to 12/31/22, excluding those with prior CRS diagnosis. The cohort was divided into three groups: pre-pandemic period (control; 1/1/18–2/29/20), pandemic period (3/1/20–12/31/22) with prior COVID-19 infection, and pandemic period without prior COVID-19 infection. CRS incidence by month was calculated for each group. Adjusted incidence rate ratios (aIRR) at 95% confidence intervals (CI) were calculated between pre-pandemic and pandemic groups, adjusting for age, sex, and clinical covariates (smoking history, asthma, and chronic lung disease) using Poisson regression for count.

Results:
4,821 patients with CRS were identified, with 4,426 (91.8%) in the pre-pandemic period, 233 (4.8%) in the COVID-19 group, and 162 (3.4%) in the non-COVID-19 group. The CRS incidence was reduced in the COVID-19 group compared to controls (aIRR: 0.055, 95% CI 0.048 to 0.063, $p<0.001$) and reduced in the non-COVID-19 group compared to controls (aIRR: 0.080, 95% CI 0.034 to 0.047, $p<0.001$).

Conclusion:
There was a lower incidence of CRS during the COVID-19 pandemic compared to pre-pandemic controls, potentially from underuse of health care. Future studies are needed to assess CRS burden during the pandemic.

Poster #C032

**Comparing estimated and actual blood loss in FESS**

Kevin Fujita-Howie, MD
Hunter McCurdy, Medical Student
Andrew Salib, Medical Student
Andrew Craver, Medical Student
Ryan Rimmer, MD, FARS
Eric Schneider, MD
R. Peter Manes, MD, FARS
Yale School of Medicine

Background:
While grading scales that help estimate the amount of bleeding during endoscopic sinus surgery exist, studies have shown that most healthcare professionals report inaccurate blood loss estimates when only visualizing the surgical field. The purpose of this study was to determine if there is a correlation between estimated and actual blood loss in endoscopic sinus surgery.

Methods:
This was a prospective study of functional endoscopic sinus surgery (FESS) cases with or without septoplasty on patients, 18 years or older, with chronic sinusitis from August 2021 through August 2023. Estimated blood loss (EBL) was reported by the operating surgeons at the end of each case. Actual blood loss (ABL) was calculated by subtracting irrigation volume from the collected fluid volume.

Results:
A total of 51 cases were analyzed with an average duration of 89.8 +/- 44.9 min. Average EBL and ABL were not significant (136.2 +/- 17.3mL vs 151.7 +/- 21.8mL, p=0.24). The overall positive correlation between EBL and ABL was 0.80, which was significant ($p<0.01$). There were also significant ($p<0.01$) positive correlations between EBL and ABL for the presence and absence of polyps ($r=0.85$ and $r=0.73$, respectively). Linear regression analysis between the difference from ABL and EBL and the duration of the surgery was not significant ($beta=0.143$, $p=0.629$).

Conclusion:
There is a significant correlation between estimated and actual blood loss in FESS, regardless of the presence of polyps, and the difference does not significantly change as the procedure duration increases. With a strong correlation, estimated blood loss can impact decision making for post-operative management.

Poster #C033

**CRS in patients with hematologic malignancies who have undergone organ transplantation**

Karol Avila-Castano, MD
Estephania Candelo, MD, MSc
Anyull D. Bohorquez Caballero, MD
Angela M. Donaldson, MD, FARS
Mayo Clinic, Florida

Background:
The literature suggests that hematological malignancies (HM) are associated with the development of chronic rhinosinusitis (CRS). However, the data on incidence and potential risk factors for CRS in this population after organ transplant (OT) is limited. Our study aims to determine the incidence of CRS and Recalcitrant CRS (RCRS) and identify associated risk factors for the development of CRS in HM who have undergone OT.

Method:
This is a retrospective review including 835 adults with HM who underwent OT at Mayo Clinic between 2017 and 2022. Patients were grouped according to the presence of CRS and subsequently by the need for endoscopic sinus surgery due to RCRS. Risk factors for CRS and RCRS were identified using logistic regression analysis.

Results:
253 of the 835 patients (30.0%) had CRS, and 74/253(29.2%) had RCRS. Based on the multivariate logistic analysis, post-transplant development of CRS was 3.7 times more likely in patients diagnosed with plasmacytoma (95% CI 1.107-12.685, p=0.034). Risk factors including primary immunodeficiency, history of pre-transplant sinus infection, and diabetes were identified as risk factors for CRS. CRS patients diagnosed with bronchiectasis or treated with methotrexate had increased risk of RCRS with a likelihood ratio of 8.4 and 2.1, (95% CI 2.046-34.932, p=0.003) and (95% CI 1.156-4.147, p=0.016), respectively.

Conclusion:
Approximately 30% of patients with HM developed CRS and/or RCRS post-transplant. Plasmacytoma is the most likely HM to develop CRS. Patients with certain hematologic conditions, systemic comorbidities, and sinus infection history had an increased likelihood of developing CRS.

Poster #C034
**CRS onset in solid vs non-solid transplanted population**
Anyull Bohorquez, MD
Estephania Candelo, MD
Karol Avila-Castano, MD
Angela M. Donaldson, MD, FARS
Mayo Clinic Florida

Introduction:
Chronic rhinosinusitis (CRS) affects approximately 30% of the transplant population. Despite growing research, there is little evidence on the estimated timing in which CRS symptoms develop after transplant. This gap as well as potential differences between solid and non-solid transplantation remains unexplored. We aim to analyze the time to CRS diagnosis after solid versus non-solid transplantation.

Methods:
This retrospective cohort study analyzed 2,128 transplanted patients with a rhinology consult at Mayo Clinic between 2017 and 2022. Patients were categorized into five groups based on time to CRS diagnosis: <6, 6 to 12, 12 to 24, 24 to 60, and > 60 months. A Kaplan-Meier curve was used for time to event analysis and a proportional Cox hazard regression model evaluated mean survival time by transplant type and known risk factors.

Results:
603 transplanted patients developed CRS with 379 (62.9%) having had solid-organ transplant. 50% were diagnosed within the first 36 months. Non-solid transplants experienced earlier diagnoses than solid recipients (median event time: 23 vs. 46 months, $p<0.0001$). Additionally, non-solid transplants recipients demonstrated an increased propensity for developing CRS during the five years post-transplant (HR:1.79, $p=0.005$ at six; HR:1.96, $p=0.006$ from 6-12; HR:2.45, $p<0.001$ from 12-24; HR:1.67, $p=0.001$ from 24 to 60 months).

Conclusion:
Half of the transplanted population who develop CRS will be diagnosed within 3 years of transplantation. Physicians should consider the type and timing of transplant, in addition to the presence of risk factors in the effective and timely management of CRS among this population.

Poster #035
**CRSwNP disease burden by subspecialty**
David W. Jang, MD, FARS
Larry Borish, MD
Jeb Justice, MD, FARS
Laurie M. McWilliams, Dr.
Changming Xia, Dr.
Timothy Phalen, Dr.
Lucia De Prado Gomez, Dr.
Mark Corbett, Dr.
Scott Nash, Dr.
Juby A. Jacob-Nara, Dr.
Harry Sacks, MD
University of Virginia Health System

Background:
Characteristics and treatment approaches for patients with chronic rhinosinusitis with nasal polyps (CRSwNP) may differ between ear, nose, and throat (ENT) specialists and allergists. AROMA is a prospective global registry of patients initiating dupilumab for CRSwNP in real-world practice.

Methods:
Baseline characteristics were assessed according to physician specialty from a planned interim analysis (Feb 2023) of patients enrolled at US sites in AROMA.

Results:
Overall, 115 and 131 patients received care from an ENT specialist and allergist, respectively; 82 patients received care from both specialties. Demographics (mean age 49–50 years, 57–59% female, 76–81% White) were similar across the 3 groups (ENT/allergist/both). Overall, 52–54% had prior surgery; 66% had used oral corticosteroids in the preceding 2 years; and 97–99% had coexisting type 2 diseases. The pattern of standard-of-care assessments was similar across groups: 89–93% of patients were assessed for patient-reported symptoms (Loss of Smell [LoS; range 0–3], Nasal Congestion [NC; 0–3], Total Symptom Score [TSS; 0–9]), and 79–85% for HRQoL (22-item Sinonasal Outcome Test [SNOT-22; 0–110]). Mean scores were LoS, 1.9; NC, 1.5–1.7; TSS, 4.7–4.9; SNOT-22, 37–40. Regardless of specialty, other assessments were infrequent, including University of Pennsylvania Smell Identification Test (26–35% of patients), CT scans (8–11%), and biomarkers (eosinophils 10–13%; IgE 12–15%).

Conclusion:
Adult patients who initiated dupilumab for CRSwNP in US real-world practice had a consistently high burden of disease across all measures, and had minimal differences in baseline characteristics by specialty, suggesting similar management approaches for ENTs and allergists.

Poster #C036

**Delayed nasopharyngeal stenosis and clival osteoradionecrosis in patient with chondrosarcoma**

Antonio Bon-Nieves, BS
Angela Kaczorowski
Rahul Alapati, Research Fellow
Amelia Lawrence, Research Fellow
Sarah Wagoner, BS
Jennifer Villwock, MD
University of Kansas Medical Center

Introduction:
Clival Osteoradionecrosis (CO) and nasopharyngeal stenosis (NPS) are rare complications from radiation therapy for cancers of the head and neck region. CO has an estimated incidence of 1-15%. It presents a unique challenge in diagnosis and treatment due to non-specific symptoms and proximity to critical brain structures. We describe a case of delayed CO and NPS – after more than 20 years of initial treatment with radiation therapy focused on the maxilla.

Case Report:
This is the case of a 53-year-old male with a history of right maxillary chondrosarcoma treated with surgical excision in 1996, followed by revision surgery and radiation for recurrence in 1999. The patient then presented to the clinic 24 years later due to discharge from his left nostril. Imaging demonstrated findings of right choanal atresia and CO.

Conclusion:
CO is an infrequent complication of radiation therapy. No previous studies describe a case of a patient who suffered two extremely rare adverse effects of radiation therapy. Better characterization of these rare complications can lead to better early identification and treatment options that can be tailored to this patient population.

Poster #C037

**Delayed vision loss s/p resection of tuberculum sellae meningioma by endoscopic endonasal surgery**

Mélyssa Fortin, MD
Sylvie Nadeau, Dr.
Martin Côté, Dr.
Pierre-Olivier Champagne, Dr.
Laval University Medical Center, Canada

Meningiomas are the most common tumors affecting the central nervous system, and their location determines the associated signs and symptoms. In this regard, tuberculum sellae meningiomas (TSM) are in close anatomic proximity to the optic nerves and frequently compress the latter as they grow. Thus, these patients often present with decreased visual acuity and visual field defects for which surgery is indicated. TSM can be resected by transcranial or endoscopic endonasal surgical approaches. Postoperative delayed vision loss is a rare but dreadful complication. The mechanisms leading to this event, following a seemingly normal postoperative course, remain obscure. This case series reports the first two cases of late vision loss after endoscopic endonasal resection of a TSM. The authors put forward the hypothesis that ischemic optic nerve neuropathy might be the pathological process contributing to this complication in a multifactorial fashion, including arterial vasospasm, venous congestion and reperfusion injury as major contributors. The novel knowledge gained from these two cases help reinforce the current understanding of this complication in order to target new preventive and therapeutic measures given a narrow therapeutic window.

Poster #C038

**Demographic and research characteristics of United States rhinology fellowship directors**

Mark Mascera, MEng
Victoria Vought, BA
Rita Vought, BA
Ava Herzog
Haris Waseem, BS
Andrew Lee
Suat Kilic, MD
Jean Anderson Eloy, MD, FARS

Background:
Program Directors (PDs) of Rhinology fellowships vary in their research productivity and industry funding. This study evaluates the relationship between demographic variables and the research activity and industry funding received by fellowship PDs.

Methods:
Rhinology fellowship PDs were identified using the American Rhinologic Society website. Demographic data was collected, including years since fellowship graduation (representing years in practice), location, and presence of non-medical professional degrees. PD h-index was extracted from Scopus, and iCite was used to calculate mean Relative Citation Ration (m-RCR) and weighted RCR (w-RCR). Average CMS payment was calculated by dividing the total General Payments listed on the CMS Open Payments website by number of payments received.

Results:
PDs that graduated fellowship less than 15 years ago had an average h-index (21.0 vs 33.7, $p<0.001$) and w-RCR (137.2 vs 239.5, $p=0.006$) lower than peers with greater years in practice, although no differences were observed in m-RCR (2.0 vs 2.4, $p=0.117$). No associations were observed between these measures and geographical location or the presence of non-medical professional degrees. A statistically significant relationship was observed between program location and average CMS payment size (Midwest= $705.38, Northeast= $621.88, West= $577.08, South= $438.93, Non-US= $8.43; $p=0.035$), although no differences were identified by PD years of practice and additional degrees.

Conclusion:
Greater years in practice were associated with greater research impact but not output, and differences in funding were observed based on location. These trends may reflect differences in opportunity or interest among PDs in academic rhinology.

Poster #C039

**Demographics, clinical features, and follow-up trends of sinus surgery patients**

Ravi Dhamija, BA
Manisha Naganatanahalli, BS
Claudia Cabrera, MD
Kenneth Rodriguez, MD
Brian D'Anza, MD
Case Western Reserve University, School of Medicine

Introduction:
Diagnosis and management of chronic rhinosinusitis (CRS) poses a significant healthcare burden. This study compares demographics, initial visit attributes, and follow-up trends in patients who underwent sinus surgery compared to those who didn't.

Methods:
A retrospective review of adult patients (n=1,239) who presented to a tertiary rhinology clinic from 2017-2019 with a sinus-related chief complaint was conducted. Cohorts were analyzed using summary statistics, Pearson's Chi-square test, and independent t-tests.

Results:
Out of 886 patients included in this analysis, 109 underwent sinus surgery, and were younger (mean age: 44.9) than non-surgical patients (mean age: 49.7, $p=0.007$). Gender and racial distributions did not differ significantly. 21.1% surgery patients had Medicaid/CareSource, 12.8% had Medicare, and 63.3% had private insurance, contrasting with 18.2%, 20.1%, and 57.1% respectively in the non-surgery group ($p=0.022$). 11.0% of surgery patients presented with CRS diagnosis at the initial visit, compared to 2.8% in the non-surgical group ($p<0.001$). In the non-surgical group, out of patients asked to follow-up, 49.0% followed-up after the first visit, compared to 100.0% of surgical patients ($p<0.001$). Surgical patients also had a shorter follow-up time between their first and second visits (median days [IQR]: 35.0 [28.0-53.8] vs. 46.0 [32.5-66.0]).

Conclusion:
This analysis revealed significant differences in age, insurance status, pre-existing CRS diagnosis, follow-up rates, and follow-up time between surgical and non-surgical patient groups. These findings underscore the necessity of considering demographic factors, and other non-clinical features, in creating a tailored plan for CRS patients.

Poster #C040
**Detection of plagiarism among rhinology scientific journals**
Ezer Benaim, MD
Saima Wase, MS
Saïf Zaidi, Medical Student
Aurelia S. Monk, BS
Cristine Klatt-Cromwell, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
Adam Kimple, MD, PhD, FARS
Brent Senior, MD, FARS
University of North Carolina-Chapel Hill

Introduction:
Plagiarism can present along a spectrum from subtle and unintentional to blatant scientific misconduct. Scientific journals have been increasingly incorporating plagiarism-checking technology. The objective of this study was to detect the incidence of plagiarism in journals within rhinology and its associations with article characteristics.

Methods:
Starting from the initial issue in 2023, sixty consecutive articles from AJRA, Rhinology, and IFAR (twenty each) were examined with Ithenticate, a plagiarism-analysis tool. Sentences were considered plagiarized if >80% were identical to another source with no quotations. Method sections were excluded from analysis.

Results:
25 articles (42%) contained at least one plagiarized sentence. The mean similarity score (percentage of text matching another source) among all articles was 16.9%. Most articles with plagiarism contained elements of self-plagiarism via text recycling (84%). 41% of plagiarized sentences contained cited material with no quotations. The discussion section contained the highest incidence of plagiarized sentences. No significant differences in plagiarism were seen when comparing journals, article type, region of origin, and type of research. Similarity scores were significantly increased for non-Western or non-English primary language countries. Binary logistic regression of similarity scores and detection of plagiarism suggests a cut-off value of 23-35%, depending on preference for higher sensitivity or specificity.

Conclusion:
25/60 articles contained plagiarized elements, most commonly self-plagiarized from previous articles. Journals and authors may consider incorporating plagiarism-detection tools to flag for modification prior to peer review.

Poster #C041
**WITHDRAWN**

Poster #C042
**WITHDRAWN**

Poster #043
**WITHDRAWN**

Poster #C044

**Efficacy of preoperative procedural patient education to mitigate stress and anxiety: A randomized controlled trial**

Ranny Assaf, MD
University Hospital Greifswald, Germany

Patients awaiting ENT surgery experience significant physical and psychological stress. While preoperative education benefits surgical patients generally, its effectiveness in ENT surgery remains unclear.

This randomized controlled trial included 164 inpatient ENT surgery cases. Two groups received either procedural patient education or standard preparation. We assessed perioperative state anxiety using the State-Trait Operation Anxiety (STOA) inventory at multiple points (T1, T2, T3, and T4). Stress and anxiety were also measured with the Numeric Rating Scale (NRS) and vital signs (BP, RR, HR). A user evaluation questionnaire gauged education usefulness.

Of 164 participants, 152 completed the trial. Preoperative education significantly reduced state anxiety on the day of surgery (mean difference +2.15, P=0.03) compared to no education (mean difference 3.09, P=0.04). Those finding education helpful (rated 6-10) experienced lower stress (M=+2.80) than the control group (M=+4.04, P=0.05). Vital signs showed no significant differences. Female patients in the education group had significantly lower postoperative stress (M=-2.95) compared to the control group (M=-2.19; P=0.04), with a similar but non-significant trend for male patients (P=0.10).

Preoperative education effectively reduces stress and anxiety in ENT surgery patients, supporting its integration into standard practice. Offering it to patients who value it is crucial, as our study demonstrates substantial benefits. These findings have significant implications for enhancing ENT surgery patients' perioperative experience.

Poster #C045

**Efficacy of steroid rinses and smell retraining in restoring olfactory function in COVID**

Ethan McGann, MD
Saima Wase, MS
Ashley Schemel, MD
Adam Kimple, MD, PhD, FARS
Gregory Capra, MD, FARS

Background:
Olfactory dysfunction (OD) is a common and often distressing symptom in patients with COVID-19 patients. Long term OD has been reported in up to 30% of patients with COVID-19. There is no consensus on the optimal treatment for COVID-19 OD. Common treatments for OD include olfactory retraining therapy (ORT) and/or topical steroids. We sought to investigate improvement in OD in patients using ORT and budesonide irrigations.

Methods:
We retrospectively identified 43 patients with OD secondary to COVID-19 infection who were treated with budesonide steroid rinses (0.5mg / 2ml) and smell olfactory retraining therapy (ORT). Objective UPSIT scores and subjective reports of smell recovery were collected at the initial presentation and at 6 week follow-up visit.

Results:
Improvement was noted in 17/30 (56.7%) patients with average improvement 3.8 on the UPSIT. Despite treatment 11/30 (36.7%) patients had worsening olfactory dysfunction at followup, with average decrease in of 5.7 on the UPSIT. No change in UPSIT score was observed in 2/30 (6.7%) patients. Despite the objective data with the UPSIT, 23/30 (76.7%) patients subjectively reported improvement.

Conclusion:
The majority of patient had improvement on ORT and budesonide irrigations; however, the observed improvement was less than the MCID for the UPSIT. Worsening of OD was observed in 36.7% of patients. Further research, including prospective studies, is needed to confirm better define the optimal treatment for patients with OD or if there are subpopulations that should be targeted for these therapies.

Poster #C046
**Emerging imaging techniques for the diagnosis of CRS**
Adwight Risbud, MD
Mehdi Abouzari
Jonathan Pang, MS
Karen Tawk
Madelyn Frank, Medical Student
Kayla Umemoto
Cedars Sinai Medical Center

Objective:
To review recent experimental imaging techniques for the diagnosis of chronic rhinosinusitis (CRS).

Methods:
MEDLINE (via PubMed), Ovid Medline, and Google Scholar databases were searched for relevant articles between January 1, 2005, and October 1, 2023.

Results:
Four major imaging techniques are being studied for CRS diagnosis: near-infrared imaging (NIR), optical coherence tomography (OCT), spectroscopy, and thermal imaging. In NIR imaging, NIR light enhances maxillary sinus illumination. Studies suggest that variations in NIR images (mucosal sinus thickening or opacification) correlate with maxillary sinus disease severity. In OCT, near-infrared light source captures high-resolution, cross-sectional microscopic images of tissue. Studies show that it can detect biofilms or defects in ciliary clearance in nasal polyp samples from CRS patients. In spectroscopy, molecular oxygen absorbs light that travels through superficial facial tissues and gas-filled sinus cavities, then absorption signals are scattered onto a detector. Laser spectroscopy can measure the volume and composition of gas in human sinus cavities and determine inflammation status. Thermal imaging maps variations of outer body surface-temperature by measuring electromagnetic radiation emission intensity. Significant unilateral hyperthermia indicates acute maxillary rhinosinusitis.

Conclusions:
New diagnostic techniques in CRS demonstrate capability in evaluating the presence and extent of sinus disease, potentially serving as alternatives to computed tomography scan in select settings. More studies are being conducted to determine the true diagnostic value of these modalities. Limitations include their cost and variable efficacy in clinical trials.

Poster #C047
**Empty nose syndrome: A systematic review of management options**
Salman Hussain MB, BCh, BAO
Jafar Hayat
Hamad Almhanedi
Mohammed Alherz
Ali Lari
Andrew Thamboo, MD

Introduction:
Empty nose syndrome (ENS) is an acquired condition characterized by nasal dryness, crusting and paradoxical nasal obstruction, typically occurring after the loss of inferior turbinate tissue or volume in the setting of prior sinonasal surgery. This review aims to identify and evaluate the reported management options.

Methods:
The terms “empty nose syndrome” OR “atrophic rhinitis” were used in a systematic search of original articles since the year 1990 in PubMed, Scopus and Web of Science, yielding 1115 individual studies. These were screened on the Covidence platform for inclusion if any intervention was reported for the treatment of ENS. Due to the heterogeneity of study designs and outcome measures, findings were summarised and analysed descriptively.

Results:
A total of 20 articles were included, comprising of 362 individual ENS patients. Surgical interventions mostly in the form of meatus augmentation implants accounted for 16 out of the 20 articles. The remaining 4 included 2 case reports on acupuncture and psychiatric therapy, a study on trigeminal training in 14 patients, and a recent study of cognitive behavioural therapy and antidepressants in 28 patients. All 20 articles reported favorable outcomes following their chosen interventions.

Conclusion:
There is a paucity of evidence on the management of ENS, and an absence of randomized controlled trials. Surgical intervention appears to be the current mainstay of treatment, but there is a potential role for psychiatric therapy.

Poster #C048

**Endoscopic endonasal approach to control of pterygoid plexus hemorrhage following LeFort I osteotomy**

Paul Cowan, DO, MS
Joseph Celidonio, BS
Giant Lin, MD
Gregg Jacob, MD
Jessica Lee, MD
Rutgers New Jersey Medical School

Background:
We describe an endoscopic endonasal approach for control of severe post-operative epistaxis following maxillomandibular advancement and highlight an alternative method to traditional embolization.

Methods:
Case report and literature review

Results:
Case Description

A 26-year-old male with severe obstructive sleep apnea underwent LeFort I osteotomy for maxillomandibular advancement (MMA) surgery. On post-operative day 1, the patient experienced severe epistaxis, which was intermittently controlled with nasal packing. He underwent bilateral sphenopalatine artery ligation by interventional radiology, but intractable epistaxis continued on the left side and he was not able to be extubated. Emergent endoscopic endonasal exploration showed slow but continuous venous bleeding emanating from the left pterygoid venous plexus. Bleeding was controlled with thrombin hemostatic matrix (Surgiflo) and Surgicel packing. The patient was extubated the following day uneventfully, and the rest of the postoperative course was uneventful.

Conclusions:
Post-operative epistaxis following LeFort I osteotomies are a rare but potentially serious complication, estimated in the literature to occur at a rate of 0.75%. It may be controlled with nasal packing, but severe cases may require embolization of the internal maxillary or its distal branches. We present the first known case in the literature of minimally invasive control of post-operative venous bleeding after MMA by endonasal technique, potentially avoiding morbidities associated with arterial embolization and open techniques.

Poster #C049

**Enhancing efficiency and reducing costs through instrument consolidation in endoscopic sinus surgery**

Anish Kosanam, BS
Kenneth Rodriguez, MD
Brian D'Anza, MD
Divya Balchander

Background:
With rising healthcare costs and an increasing financial strain on hospitals, particularly in the aftermath of the COVID-19 pandemic, there's a pressing need to optimize operating room efficiency. This study explored the potential cost savings and efficiency gains from instrument consolidation in endoscopic sinus surgery (ESS), a procedure often considered for patients with refractory chronic sinusitis.

Methods:
In this quality improvement study, a comprehensive review of instruments utilized for ESS was performed at this high-volume surgical institution. Surgical trays for both basic and advanced ESS were optimized by eliminating instruments not regularly utilized. Outcomes, including financial implications, labor hours, and instrument utilization rates, were then compared pre- and post-intervention over an 18-month period.

Results:
After optimization, 39 superfluous instruments, which were found to be redundant or of historical significance, were eliminated across two sets. This adjustment led to 20,358 fewer instruments being processed annually, saving 48 labor hours in instrument inspection. The financial impact of these changes translated to a projected annual savings of $10,382 in reprocessing costs and an additional $828 saved in labor costs.

Conclusion:
Within the scope of ESS, instrument consolidation emerged as a significant strategy for cost savings and operational efficiency improvement. The success of this intervention in ESS suggests potential for extrapolating similar strategies to other ENT surgeries. As the healthcare field grapples with escalating costs, embracing this innovative approach can ensure hospital financial resilience and upholding quality patient care.

Poster #C050
**Evaluating ChatGPT as a patient education tool for COVID-19-induced olfactory dysfunction**
Elliott Sina, BA
Daniel J. Campbell, MD
Alexander Duffy, MD
Shreya Mandloi
Peter Benedict, MD
Douglas Farquhar, MD, MPH
Aykut Unsal, MD
Gurston Nyquist, MD, FARS
Sidney Kimmel Medical College, Thomas Jefferson University

While most patients with COVID-19-induced olfactory dysfunction (OD) recover spontaneously, those with persistent OD face significant physical and psychological sequelae. ChatGPT, an artificial intelligence chatbot, has grown as a tool for patient education. This study seeks to evaluate the quality of ChatGPT-generated responses for COVID-19 OD.

ChatGPT (GPT-4) was queried 4 times with 30 identical questions. Prior to questioning, Chat-GPT was “prompted” to respond 1) to a patient, 2) to an 8th grader, 3) with references, and 4) no prompt. Answer accuracy was independently scored by four rhinologists using the Global Quality Score (GCS, range:1-5). Proportions of responses at incremental score thresholds were compared by prompt type using chi-squared analysis. Flesch-Kincaid grade level was calculated for each answer. Relationship between prompt type and grade level was assessed via analysis of variance.

Across all graded responses (n=480), 364 responses (75.8%) were “at least good” (GCS≥4). Proportions of responses that were “at least good” ($p<0.0001$) or “excellent” (GCS=5) ($p<0.0001$) differed by prompt; responses that were “at least moderate” (GCS≥3) did not ($p = 0.687$). 8th-grade level (14.06 ± 2.3) and patient-friendly (14.33 ± 2.0) responses were a significantly lower mean grade level than no prompting ($p<0.0001$).

ChatGPT provides appropriate answers to most questions on COVID-19 OD regardless of prompting. However, prompting influences response quality and grade level. ChatGPT responds at grade levels above accepted recommendations for presenting medical information to patients. Currently, ChatGPT offers significant potential for patient education as an adjunct to the conventional patient-physician relationship.

Poster #C051
**WITHDRAWN**

Poster #C052
**Extranodal NK/T-cell lymphoma, nasal type: A diagnostic challenge**
Jee-hong Kim, MD
Yuna Kim, Resident
Alison Yu, Resident
University of Nevada Las Vegas

Introduction:
Extranodal natural killer/T-cell (NK/T-cell) lymphoma, nasal type, is a rare and aggressive form of lymphoma resulting in progressive midline facial destruction. This case report documents a distinctive presentation and diagnostic challenge in an otherwise healthy patient.

Case:
19-year-old Hispanic male initially presented with painless right facial swelling. He was treated with a two-week course of antibiotics. However, the patient returned with worsening periorbital edema, and a CT scan revealed complete opacification of the right maxillary sinus. The patient underwent functional endoscopic sinus surgery (FESS) and received intravenous antibiotics. Despite these interventions, his clinical condition deteriorated, with the extension of tissue edema to the right hemi-face and the development of ophthalmoplegia.

Subsequent MRI findings indicated the progression of the disease to involve the right masticator space, pterygopalatine fossa, infratemporal fossa, and temporal space. An endoscopic secondary examination revealed extensive tissue necrosis in this region, sparing septum and palate, which raised concerns regarding necrotizing fasciitis or invasive fungal disease. However, after an Epstein-Barr virus stain and additional staining, a definitive diagnosis of NK/T-cell lymphoma was established.

Significance:
This case underscores the significance of considering uncommon pathologies in patients exhibiting aggressive symptoms akin to sinusitis that do not respond to standard treatments. NK/T-cell lymphoma should be considered as a potential diagnosis, even in the absence of midline nasal destruction. While extensive tissue necrosis is a hallmark of the disease, it is advisable to avoid radical surgical intervention.

Poster #C053
**Factors associated with sinonasal epithelial-myoepithelial carcinoma survival outcomes**
Vanshika Narala, BS
Sharanya Thodupunoori, Medical Student
Samuel Auger, Resident
Christopher Roxbury, MD, FARS
Pritzker School of Medicine, University of Chicago

Introduction:
Epithelial-myoepithelial carcinoma of the sinonasal tract (EMCSN) is a rare, biphasic salivary gland malignancy. Age, race, TNM stage, and treatment modality are associated with overall survival (OS). There are currently no guidelines for the utilization of adjuvant radiation therapy (XRT). This study aims to determine factors associated with OS for EMCSN patients and explore whether XRT improves OS.

Methods:
The National Cancer Database was used to identify all patients diagnosed with EMCSN between January 1, 2004-December 31, 2020. The primary outcome was OS. Associations between adjuvant XRT and OS were analyzed with uni- and multi-variable Cox proportional hazards regression. Subgroup analyses were performed based on margin status.

Results:
Of 69 patients, 85.5% were white, 58% female and 43.5% > 70 years old. Most tumors were T1 (56.5%) and in the nasal cavity (65.2%). OS at 5- and 10-years were 77.2% and 48%. Most had surgery (89.8%), 27.5% received XRT and 8.7% received chemotherapy. Surgery was associated with longer median OS (66.5 vs 21 months, p =0.007), especially when negative margins were achieved (p=0.028). Adjuvant XRT was not associated with improved OS regardless of margin status (p=0.12). Five patients with positive margins received XRT, making analysis of this subgroup unfeasible. On multivariable analysis, improved OS was associated with private insurance (hazard ratio (HR) 0.16; 95% CI 0.04-0.61) while T3/T4 stage was associated with worse OS (HR 3.56; 95% CI 1.29-9.84).

Conclusion:
Negative margin surgery is associated with improved OS in EMCSN. Adjuvant XRT did not improve OS, regardless of margin status. Multicenter trials are needed to better understand the role of XRT in this rare malignancy.

Poster #C054

**Factors influencing patient satisfaction in tertiary rhinology clinics**

Michael Yim, MD, FARS
Mackenzie Latour, MD
Tariq Syed, MS
Omar Ahmed, MD, FARS
Richard Orlandi, MD, FARS
LSU Health Shreveport

Background:
Prior studies have shown that patient-dependent determinants influence patient satisfaction and contribute to variance across different specialties. This study sought to describe determinants of satisfaction in outpatient rhinology tertiary care centers.

Methods:
A multi-institutional retrospective review was performed to evaluate patient encounters from three academic rhinology clinics from January 2020 through June 2022. Potential determinants of satisfaction, including patient characteristics, demographic data, and encounter details were assessed for association with Press Ganey Outpatient Medical Practice Survey (PGOMS) satisfaction responses.

Results:
A total of 892 patient encounters were assessed. 92.5% were likely to recommend their provider to others, whereas only 60% of patients were maximally satisfied across all assessed metrics. No association was found between demographics and patient satisfaction. The determinant identified as most influential in satisfaction subscores was insurance type. Visit type was found to be associated with overall satisfaction scores, with established patients reporting higher overall satisfaction (p=0.03).

Conclusion:
Large discrepancies in satisfaction with provider-related metrics and overall satisfaction metrics points to health-care system related barriers to optimal patient satisfaction in rhinology clinics. While several determinants emerged as influential factors for overall satisfaction, the lack of significance on multivariate regression underscores the nuanced interplay of individual patient factors, their expectations, and resultant satisfaction level.

Poster #C055

**Factors influencing surgeon choice for revision sinus surgery: NHIRD study**

Chun-Kang Liao, MD
Chia-Hsuan Lee, MD
Wei-Chung Hsu, MD, PhD
Kun-Tai Kang, MD
Te-Huei Yeh, Prof.
National Taiwan University YunLin Bracnch, TW

Introduction:
Revision endoscopic sinus surgery (ESS) is a great way to manage complex sinus disease. The purpose of this study is to explore the incidence of and clinicodemographic factors associated with patients opting for a different surgeon for their revision endoscopic sinus surgery (ESS).

Study Design:
Nationwide retrospective cohort study by using the Taiwan National Health Insurance Research Database (NHIRD).

Methods:
Adult patients who underwent their initial ESS between 2000 and 2010 and their first revision ESS before 2020 were included in the study. Multivariable regression analysis was used to determine characteristics associated with a change in surgeon.

Results:
Of the 12,205 patients included in the study, 68.7% opted for a different surgeon for their revision ESS. Multivariable analysis identified a low cumulative surgeon volume (OR: 2.51; 95% CI: 2.31-2.73) and an extended interval between primary and revision surgeries (OR: 1.17; 95% CI: 1.15-1.18) as significant predictors for changing surgeons. Patient age, sex, comorbidities (including asthma, allergic rhinitis, or nasal polyps), and the complexity of patient conditions (reflected by surgery duration and Charlson comorbidity Index score) did not significantly influence the choice of surgeon for the subsequent procedure.

Conclusions:
Nearly 2/3 of patients who undergo revision ESS select a surgeon other than the one who performed their primary procedure. A low cumulative surgeon volume and a longer interval before the revision surgery increase the likelihood of a change in surgeon for revision ESS. These findings offer a preliminary understanding of the factors influencing patient choices in the surgical treatment of refractory chronic rhinosinusitis.

Poster #C056
**Frontal bone lymphoma masquerading as Pott's Puffy Tumor: A case report**
Jeremy Chee, MBBS

Frontal sinus lymphoma is a rare condition, and can be difficult to diagnose. We aim to summarize our findings in diagnosis and management of a patient with frontal bone lymphoma, illustrating the potential difficulty in differentiating between inflammatory and neoplastic conditions.

A 44-year-old Caucasian man presented initially with a rapidly increasing right forehead swelling following a 6 month duration of blocked nose, purulent nasal discharge, and frontal pressure sensation for a 6 month duration. A presumptive diagnosis of frontal osteomyelitis was made based on MRI findings. He completed a 7 week course of empiric intravenous antibiotics with good response, though the swelling returned again after the antibiotics were stopped. Initial surgery and biopsies showed only inflammatory cells on histology. The facial swelling continued to worsen despite culture directed antibiotics, and a repeat MRI showed two foci of frontal bone involvement with an adjacent small subdural empyema, as well as lateral frontal sinus opacification. A repeat surgery and biopsy finally revealed diffuse large B-cell lymphoma on histology. Chemotherapy was administered subsequently.

Frontal sinus lymphoma is a rare occurrence, and can masquerade as Pott's puffy tumor. A high index of suspicion is necessary for early diagnosis and treatment.

Poster #C057
**Frontal sinus mucocele with advanced orbital complications**
Raisa Chowdhury, MSc
Jessica Hier, Dr.
Lamiae Himdi, Dr.

Background:
Paranasal sinus mucoceles, commonly found in the frontal sinus, can manifest with symptoms like frontal pressure, periorbital swelling, restricted ocular movements, and changes in visual acuity and visual fields. Despite their relative frequency, the expansive and locally destructive nature of these lesions carries significant local consequences. The available literature primarily consists of case reports, and as of yet, there is no consensus on the optimal management and expected outcomes, particularly for severe cases like the one presented here.

Case presentation:
The case presented describes a left frontal sinus mucocele with resulting advanced orbital complications. The patient is a 75-year-old female who presented to our institution with a six-month history of left periorbital pain and mild diplopia. She was found to have a left frontal sinus mucocele of 5.1 x 3.4 x 3.5 cm with secondary frontal sinus bony loss, bony erosion of the orbit, intraorbital extension of the lesion and intracranial extension without dural involvement. The management of this case included an endoscopic marsupialisation of the mucocele, as well as close co-management with the ophthalmology team. Early post-operative imaging revealed a slight improvement in the orbital displacement caused by the lesion, and clinically, the patient became asymptomatic within three months of surgery.

Conclusion:
In cases of frontal sinus mucoceles with advanced orbital complications, a multidisciplinary approach is crucial. Management typically involves surgical intervention, either endoscopic or open, to address the locally destructive nature of these benign lesions. Collaboration with ophthalmology is essential, particularly when dealing with the orbit.

Poster #C058
**Gaseous orbital cellulitis: Case and review**
Keith Conti, MD
Timothy Fan, MD
David Brown, Dr.
Kara Mascitti, Dr.
Jeffrey Bedrosian, MD, FARS
St. Luke's University Health Network

Introduction:
Acute rhinosinusitis is a prevalent infectious process, most commonly of viral etiology. Most cases resolve with supportive care and/or oral antibiotics, however, a portion may develop complications and require additional management.

Methods:
This is a case report of an immunocompetent edentulous 30-year-old female who developed emphysematous orbital cellulitis associated with acute rhinosinusitis, with a review of the literature.

Results:
The patient presented to the emergency department with six days of left sided nasal congestion and one day of left sided orbital swelling. Initial computed tomography revealed partial left maxillary and ethmoid opacification with a small amount of intraconal emphysema, preseptal cellulitis, but no discrete abscess. Broad spectrum antibiotics were initiated. Within 12 hours however, the patient noted declining left visual acuity. Subsequent scan demonstrated a marked increase in intraorbital emphysema. Return to baseline was achieved via emergent left lateral canthotomy and functional endoscopic sinus surgery. Her culture isolated H. influenzae. Only three other reports of sinusitis related emphysematous orbital cellulitis without abscess exist in literature. All cases were males with a median age of 16 (14-67). The most common symptoms were periorbital swelling (100%) and ocular pain (100%). S. pneumoniae was the most common organism (67%). No vision recovery was previously reported.

Conclusion:
Acute emphysematous orbital cellulitis is an extremely uncommon adverse outcome. All prior case reports resulted in vision loss. We present a rare case of salvaged vision following a rapidly progressive disease state from a bacterial infection not commonly associated with gas production.

Poster #C059
**Gender differences following sinus surgery: A systematic review and meta-analysis**
Matthew Ryan, MD, FARS
Kedar Patel, Medical Student
Jakob Fischer, MD
Anthony Tolisano, MD
Sean Parsel, MD, FARS
Edward McCoul, MD, FARS
Charles Riley, MD
Walter Reed National Military Medical Center

Background:
The extent to which gender affects outcomes in chronic rhinosinusitis (CRS) is unclear. The objective of this study was to examine differential outcomes between genders following endoscopic sinus surgery (ESS) among CRS patients.

Methods:
PubMed, Ovid and Cochrane databases were queried. Outcomes included disease burden on imaging and endoscopy, patient-reported outcome measures (PROMs) including the Sinonasal Outcome Test (SNOT-22), revision rates, and olfactory outcomes. Meta-analysis was performed using the Mantel-Haenszel method with fixed and random effects.

Results:
Of 4,942 articles screened, 30 (n=103,499) were included for qualitative analysis and seven (n=63,485) for meta-analysis. On qualitative analysis, 19 of the 30 studies noted a significant gender difference in post-operative outcomes, with five studies favoring women and 14 favoring men. Nine of 18 studies with PROMs noted a difference between genders, all favoring men. Olfactory outcomes were mixed with studies divided on favoring men vs women. No studies noted significant gender differences of disease burden on imaging or endoscopy. Across four studies included in the meta-analysis, women had higher preoperative (standard mean difference [SMD], 0.31; 95% confidence interval [CI], 0.23–0.39) and post-operative SNOT-22 scores (SMD, 0.29; 95% CI, 0.19–0.38). There was no difference between genders on meta-analysis of 3 studies examining revision rates.

Conclusion:
Meta-analysis shows that women patients have worse pre and postoperative SNOT-22 scores. Postoperative gender differences are most apparent in studies that examined PROMs. Further research is needed to investigate the underlying causes and to eliminate disparities between genders.

Poster #C060

**Gender differences in demographics and research activity of rhinology fellowship directors**

Haris Waseem, BS
Rita Vought, BA
Victoria Vought, BA
Ava Herzog
Andrew Lee
Mark Mascera
Suat Kilic, MD
Jean Anderson Eloy, MD, FARS
Andrey Filimonov, MD

Background:
Medical fellowship director positions have historically been dominated by men, especially in surgical specialties such as otolaryngology. This study seeks to assess the research activity of male and female rhinology fellowship directors using h-index and weighted-relative citation ratio (w-RCR) to measure output and mean-RCR (m-RCR) to measure impact.

Methods:
Rhinology fellowship programs and directors were recorded from the American Rhinology Society website. Program location, the director's fellowship graduation year (representing years in practice), and any additional professional degrees were noted as well. Director names were searched in Scopus, and total publications, citations, H-index, and publication start to end time were recorded. Finally, the average m-RCR and w-RCR were calculated by exporting PubMed IDs from Scopus into iCite.

Results:
Of the 67 directors reported from 35 programs, 85% of directors were male. No significant differences in gender distribution were observed by region (p=0.73) or by presence of additional degrees (p=0.42). Similar gender distribution was also observed among directors who had been in practice for less than 14 years and those with 15 or more years in practice (p=0.89). No significant differences were observed in total publications, citations, publishing time, H-index, mean RCR, and weighted RCR (p= 0.94, 0.77, 0.52, 0.64, 0.40, and 0.79, respectively).

Conclusion:
Rhinology fellowship programs are dominated by male directors, despite no differences observed in research activity. This may indicate a lack of mentorship or opportunity for women pursuing leadership positions in academic rhinology.

Poster #C061

**Gender disparities among speakers at national rhinology conferences: A five-year analysis**

Isabel Snee, BS
Sami Alahmadi, BS
John Dowd, BS
Amir Hakimi, MD

Background:
Despite the increasing number of women specializing in otolaryngology, female underrepresentation in this field and in academic medicine as a whole continues to persist. There is limited data on trends in gender representation among speakers at national rhinology conferences.

Methods:
Retrospective review of conference programs for the American Rhinology Society (ARS) Annual Meeting between 2019 and 2023 was gathered. Data collection included speaker demographics, speaker academic appointment, and presentation time.

Results:
Across all years individually and aggregated, significantly more men participated in each annual conference ($p < 0.01$ aggregated). Despite this disparity, 2023 represented the narrowest margin between genders, with 61 men and 26 women ($p < 0.01$). Aggregating the data from all years, significantly more men gave oral presentations ($p < 0.01$), participated in panels ($p = 0.03$), and were awarded top abstracts ($p < 0.01$). Although significantly more men conferred oral presentations from 2019-2022, this disparity dissipates in 2022 and 2023, suggesting a trend toward improved gender representation. Except for 2022 ($p = 0.04$), mean speaking time between genders was not significantly different overall and between the other years included.

Conclusion:
Although there are trends towards equal representation, gender disparities still persist in ARS conference representation.

Poster #C062
**Geriatric COVID anosmia**
Nicolette Jabbour
Melani Zuckerman
Nisha Mathur
Jacob Bloom
Jessica Levi
Marianella Paz-Lansberg, MD

Objective:
To identify demographic differences between geriatric and non-geriatric patients with COVID-19-Induced Anosmia (CIA).

Study Design:
Retrospective Chart Review

Methods:
A total of 1,189 patients with COVID anosmia were identified from January 2019 – February 2021. Patients were divided into geriatric (65 years and older) and non-geriatric (less than 65 years). Demographics factors were compared between the two groups. Chi squared and Fisher's Exact Right Tail Test analysis were performed to identify potential differences.

Results:
1,042 (88%) patients were non-geriatric and 147 (12%) patients were geriatric. There was a significantly proportion of male patients presenting with CIA in the geriatric population compared to non-geriatric population ($p=0.035$). There was no significant difference between race in the geriatric and non-geriatric population . Patients who are older and have CIA are more likely to have limited English proficiency compared to non-older patients with CIA ($p<0.001$). Geriatric patients with CIA are more likely to be Hispanic compared to non-geriatric patients ($p=0.027$).

Conclusion:
Overall, the majority of patients with CIA were non-geriatric. Geriatric females may be less at risk for CIA. Geriatric patients with CIA are more likely to be male, non-english speaking, and Hispanic as compared to their non-geriatric counterparts. Further research is needed to identify differences in rates of recovery of anosmia and factors protective against CIA.

Poster #C063
**GLP-1 receptor agonist induced patulous ETD: Case report and review of otologic adverse events**
Kaitlynne Pak, MD
Raffaello Cutri, MD
Wasiq Nadeem, MD
Dhruv Kothari, Resident
Yu-Tung Wong, MD
Mia Miller, MD
Arthur Wu, MD, FARS
Cedars Sinai Medical Center

Introduction:
GLP-1 receptor agonists (GLP-1 RAs) have gained traction in the management of obesity. We explore the association between GLP-1 RAs with eustachian tube dysfunction (ETD) and patulous ETD (PETD) by review of a case, literature, and the FDA adverse event database (FAERS).

Methods:
We summarize a case of PETD onset after GLP-1 RA-induced weight loss with a literature review and analysis of the FAERS database for GLP-1 RAs from 1/1/2019 to 6/30/2023.

Results:
We present a 71-year-old female with episodic autophony after losing 35 lbs. while using tirzepatide. Nasal endoscopy confirmed significant loss of tissue bulk of the anterior and posterior ET cushions.
The total number of adverse events (AEs) with GLP-1 RAs was 97,237. The proportion of otologic AEs was 958 (0.99%): 515 hypoacusis, 203 vertigo, 97 deafness, 93 tinnitus, 22 ear pain, 21 motion sickness, 5 hyperacusis, 2 ear fullness, and 0 autophony. The largest number of potential ETD-related AEs occurred with dulaglutide (417). The greatest proportion of potential ETD-related AEs occurred with exenatide (1.52%) followed by semaglutide (1.17%) and liraglutide (1.16%).
Discussion: Ear complaints due to GLP-1 RAs have been reported previously. However, this is the first report of PETD associated with GLP-1 RAs. While literature on GLP-1 RAs and PETD is currently limited, the mechanism is well established as reports of PETD after rapid weight loss, especially in bariatric surgery, are well known. Given the rising use of GLP-1 RAs for weight loss, clinicians should be vigilant in recognizing PETD in this patient population.

Conclusion:
Otolaryngologists should be aware and monitor for possible otologic side effects, particularly PETD, with GLP-1 RA use.

Poster #C064

**Growth rate and management of incidentally found paranasal sinus osteomas**

Allen Luo
Mark Arnold, MD
Michael Tao, MD
SUNY Upstate Medical University

Paranasal sinus (PNS) osteomas are benign, slow growing bone tumors of the paranasal sinuses that have a range of presentation from asymptomatic to causing “mass effect” symptoms including facial pain, headache, and ophthalmologic complaints. Symptomatic PNS osteomas must be resected via open or endoscopic approach. However, most PNS osteomas are found incidentally during CT or MRI scans. Growth rates have been measured to be about 0.6-1mm/year for lesions requiring surgery, but to the best of our knowledge, growth rates for incidentally found, asymptomatic lesions, have only been reported by one study. Also, there is a scarcity of literature regarding how frequently to follow asymptomatic lesions and lack of consistency across practices on management. In this case series, our objective was to add to the literature regarding growth rate of asymptomatic, incidentally found osteomas and present an argument for how to follow up. At our institution, we used EPIC SlicerDicer to screen imaging studies using keyword ‘osteoma’ and included patients with at least 2 imaging studies 6 months apart that both demonstrated a PNS osteoma(s). Imaging studies with the largest time interval were selected. Non-PNS osteomas were excluded. We found 48 patients that fit this criterion with a median duration of interval imaging of 2.79 years. Growth rate was measured to be 0.39mm/year in the cephalocaudal direction and 0.45mm/year in the mediolateral direction, together averaging 0.42mm/year. Given their slow growth rate, we conclude that select lesions likely do not require follow-up. If there is concern that growth could cause an obstructive complication, such as blocking the frontal outflow tract, we argue a single scan at one year is appropriate.

Poster #C065

**Human papilloma virus vaccination (HPVV) as adjuvant tx for sinonasal squamous cell carcinoma(SNSCCa)**

Rhiannon Gillett
Alla Solyar, MD, FARS
Donald Lanza, MD, FARS
Kiran Ganga, Research Assistant
Sinus and Nasal Institute of Florida

Background:
An apparent benefit/positive response in 3 patients(pts) with HPV+ sinonasal tumors to HPVV prompted us to embark on this quality assessment and improvement report to evaluate safety, barriers to receive the HPVV as adjuvant therapy, and to standardize care at our facility for pts who are diagnosed histopathologically as HPV+ SNSCCa.

Methods:
A retrospective chart review between 2013 and October 2023 seen at our institution. Exclusion criteria included cancer other than SCCa, pts whose HPVV status is unknown, and pts lost to follow-up/ deceased unrelated cause. HIPAA compliant E-clinical chart review and telephone interviews were performed.

Results:
38 SNCCa patients were identified, of them 15 were HPV+. 1/15(6%) were low-risk and 14/15(94%) were high-risk HPV. The mean age of pts was 67 years with 67%(10/15) being men. The mean follow-up for pts was 61 months from time of cancer resection. 93%(14/15)pts were advised to get HPV vaccination and 67%(10/15) received the vaccine. The overall survival(OS) for HPV+ with vaccine was 100% (10/10) and HPV+ without vaccine was 80%(4/5). The progression-free survival(PFS) was 80%(4/5) for HPV without vaccine and 90%(9/10)with. No serious adverse reactions were reported. Barriers to receiving the vaccine include age over 46 leading to lack of insurance coverage. Additionally in the post Covid–19 Era some individuals adopt anti-vaccination thinking that has become politicized.

Conclusion:
To our knowledge this is a first report on use of HPVV as adjuvant therapy in SNSCCA pts. Though our data is limited by small sample size, the long standing safety track of HPVV and promising results seen in this report warrant further study on the use of this vaccination in this population.

Poster #C066
**Image guided sinus surgery for the practicioner: 4 years of experience looking at cost and utility**
Thomas Breinlich, MD
Valentin Breinlich, MD, MBA
HNO Praxis

As an ENT physician with admitting privileges at the ENT Department of the Hospital Ludwigsburg (now: RKH Holding Klinikum Ludwigsburg) I introduced Image Guided Surgery (“”IGS””) in 2011. The system used was the Karl Storz Surgical cockpit NPU, an optical based IGS.

I performed a prospective study of the first 24 patients and gave a presentation about my first 24 patients looking at the aspects of cost and utility at the Annual Meeting of the AAORLHNS in Washington DC 2012.
I continued with 115 more consecutive patients until september 2015 and looked at changes concerning safety, cost and utility after those 4 years.

Cost is the time I needed to start the system, transfer the data and define the registration points (tecnical setup time “”tst”” and the time needed to verify those points on the patient (patient related setup time “”pst””).
This work has to be done by the surgeon himself and therefore is of importance to my workflow.

Utility is measured looking at minor or major complications and the perceived benefit of the practicioner to perform a safe and complete surgery, even in complicated cases (multiple revisions, mucocele surgery, tumor surgery).
After those 4 years where every patient underwent FEES using Image Guidance I changed my proceedings to use IGS not on every patient.

It is a extremely helpful in complicated cases (difficult anatomy, multiple revisions, tumor surgery) where this valuable tool is used regularly.

Poster #C067
**Immune checkpoint inhibitors (ICI) induced sinonasal disease: Review of literature and FDA database**
Kaitlynne Pak, MD
Wasiq Nadeem, Research Fellow
Jordan Kai Simmons, MD
Dennis Tang, MD, FARS
Arthur Wu, MD, FARS
Cedars Sinai Medical Center

Introduction:
Immune checkpoint inhibitors (ICIs) are responsible for unique immune-related adverse events (irAEs). There is a paucity of data summarizing the sinonasal irAEs with ICIs. We report our experience of CRSwNP after ICI initiation, review literature, and analyze the FDA adverse event database (FAERS) for sinonasal irAEs with ICI therapy.

Methods:
We summarize a case of CRSwNP with pembrolizumab therapy with a literature review of sinonasal disease and the following FDA-approved ICIs: CTLA-4 inhibitors, PD-1 inhibitors, and PD-L1 inhibitors. A literature review of CRSwNP/CRSsNP and the seven FDA-approved ICIs was performed. Sinonasal irAE data pertaining to ICI therapy was collected from the FAERS database (2019 to 2023).

Results:
Literature review of CTLA-4 inhibitors yielded 1 case of CRSwNP and 1 case of CRS. Of PD-1 inhibitors, there were 8 cases of CRSwNP and 14 cases of CRS. 133,118 irAEs were reported for FDA-approved ICIs. Overall proportion of sinonasal irAEs was 0.62% with 826 cases, including 405 cases of epistaxis, 142 rhinorrhea/rhinitis, 127 sinonasal congestion or sneezing, 35 nonspecific sinonasal disease, 31 allergic rhinitis, 11 CRSwNP, and 75 other sinonasal complaints. The greatest number and highest proportion of sinonasal irAEs were reported for patients taking nivolumab (282) and atezolizumab (0.94%), respectively.

Discussion:
Data suggests ICIs can aggravate and initiate sinonasal disease. Certain ICIs may be more implicated than others as well as certain symptoms, thus monitoring patients for sinonasal irAEs undergoing ICI therapy is important.
Conclusion: Although rare, it is essential for otolaryngologists to monitor patients undergoing ICI therapy for new or exacerbated sinonasal disease.

Poster #C068

**Impact of CRS on postoperative complications after transphenoidal surgery**

Kevin Herrera, BS
Alexandra Demetriou
Sahiti Vemula
Bozena Wrobel, MD, FARS
Kevin Hur, MD
Keck School of Medicine of USC

Background:
The safety of endoscopic transphenoidal surgery (TSS) with concurrent chronic rhinosinusitis (CRS) is not well defined. We aimed to investigate how CRS affects postoperative complications.

Methods:
Using the TriNetX US collaborative database, patients 18 years or older with TSS were retrospectively followed for 3 months. Patients with concurrent CRS were propensity-score matched to patients never having been diagnosed with CRS by age, sex, race, ethnicity, BMI, diabetes, preoperative hydrocephalus, tobacco use, Cushing's syndrome, steroid use, preoperative antibiotic use, and radiation treatment history. Outcomes included CSF leak, meningitis, olfactory and gustatory disturbances, number of nasal debridements, SIADH, disorders of the pituitary gland, and hyponatremia. Measures of association and cohort statistics were calculated.

Results:
Of the 4,522 patients included, the most common neoplasms included benign neoplasms of the pituitary gland (79.7%), craniopharyngeal duct (22.9%), and meninges (2.6%). There was no significant difference in CSF leaks or postoperative pituitary disorders. Patients with CRS were more likely to experience olfactory or gustatory disturbances [OR: 4.90; 95% CI: (3.01-7.98)] and have a higher mean number of postoperative nasal debridements (0.90 vs. 0.44; p<0.0001). CRS patients were less likely to develop meningitis [OR: 0.51; 95% CI: (0.34-0.77)], SIADH [OR: 0.52; 95% CI: (0.36-0.75)], or hyponatremia [OR: 0.57; 95% CI: (0.45-0.72)].

Conclusion:
TSS patients with concurrent CRS are at increased risk of olfactory and gustatory disturbances and receiving more postoperative nasal debridements. Otherwise, CRS is not associated with worse postoperative outcomes.

Poster #C069

**Impact of monoclonal antibodies on rates of FESS in CRSwNP**

Mihai Bentan
Graham Pingree, Medical Student
Theodore Schuman, MD, FARS
VCU School of Medicine

Introduction:
The th2 helper T-cell pathway contributes to inflammatory airway diseases like chronic rhinosinusitis with nasal polyposis (CRSwNP). Monoclonal antibodies (mAbs) like dupilumab (DUP), mepolizumab (MEP), and omalizumab (OMA) have been proposed as surgery-sparing techniques, given their success in reducing sinonasal inflammation, but their effect on the need for functional endoscopic sinus surgery (FESS) remains unknown.

Methods:
CRSwNP patients without prior FESS were analyzed from the TriNetX Analytics Research Network for each mAbs market lifespan through September 2023. Propensity Score Matching adjusted for age, race, and sex to non-mAb controls. Outcomes included the absolute risk reduction (ARR) for FESS and 0-12 month postoperative acute sinusitis and hospital admission.

Results:
DUP significantly reduced FESS risk versus controls (ARR 0.19, 95% CI 0.16-0.22, p<0.001). Neither OMA (ARR 0.01, 95% CI -0.03-0.06, p=0.614) nor MEP (ARR 0.01. 95% CI 0.04-0.06, p=0.798) significantly reduced FESS risk. Postoperatively, DUP use significantly reduced risk of acute sinusitis (ARR 0.23, 95% CI 0.10-0.35, p=0.001) and admission (ARR 0.22, 95% CI 0.10-0.34, p=0.001). OMA and MEP yielded similar results for acute sinusitis (OMA, ARR 0.67, 95% CI 0.43-0.91, p<0.001; MEP, ARR 0.71, 95% CI 0.48-0.95, p<0.001) and admission (OMA, ARR 0.63, 95% CI 0.39-0.86, p<0.001; MEP, ARR 0.63, 95% CI 0.39-0.86, p<0.001).

Conclusion:
In a large dataset, DUP significantly reduced FESS risk in CRSwNP patients. All 3 mAbs significantly lowered the risk of postoperative acute sinusitis and hospital admission. This data demonstrates the potential of th2 pathway targeted mAbs on reducing disease burden and enhancing patient outcomes in CRSwNP.

Poster #C070
**Impact of OD on PROMs and QOL in older adults**

Nicole Kloosterman, MD
Zachary Soler, MD, FARS
Rodney Schlosser, MD, FARS

Background:
Olfactory dysfunction (OD) in older adults is a strong predictor of mortality, but the wide variety of nutritional, neurodegenerative, social, or cognitive factors associated with OD and relationship with mortality has not been fully examined. In this study, we explored the impact of OD on several aspects of health and QOL in older adults.

Methods:
In a prospective cohort study, adults > 50 years old underwent olfactory psychophysical testing using Sniffin Sticks and completed validated patient reported outcome measures (PROMs) assessing 1) olfactory-specific QOL, 2) depression-specific QOL, 3) isolation, 4) nutrition, and visual analog scales (VAS) assessing the impact of OD upon mood, food enjoyment, social interactions, safety, hygiene, sex, cooking, appetite and weight changes.

Results:
A total of 216 patients were evaluated. Psychophysical olfactory function was associated with VAS of nasal obstruction, smell, mood, hygiene, cooking, sex, appetite, weight, identification of gas leaks, social interactions, and olfactory specific quality of life ($p<0.05$). R ranged from -0.16 to -0.48. Olfactory function did not correlate with scores on three QOL screening tools looking at depression (PHQ9), isolation (DeJong Gierveld Scale), and nutrition (short form Mini Nutritional Assessment).

Conclusions:
Psychophysical OD in older adults is associated with a wide variety of patient reported symptoms. The precise manner in which OD may impact nutrition, depression and isolation is not well understood.

Poster #C071
**Impact of traffic on CRS severity**

Snehitha Talugula, BS
Sharmilee Nyenhuis, Associate Professor of Pediatrics and Medicine
Kamal Eldeirawi, Associate Professor of Epidemiology
Victoria Lee, MD, FARS
University of Illinois at Chicago

Background:
Environmental exposures may be associated with increased severity of chronic rhinosinusitis (CRS). Studies have linked reactive airway diseases with pollution and urbanization. However, research examining associations of traffic related air pollution with CRS is limited. The purpose of this study was to determine the association between residential traffic proximity and CRS severity in the United States.

Methods:
This study was conducted on data gathered from 181 participants documented in the NAVIGATE I AND NAVIGATE II randomized control trials within the OPTINOSE database. Zip codes for the testing locations of each participant were recorded and EPA traffic proximity data was extracted for each location. Traffic proximity was defined as the average annual daily traffic at major roads within the zip code. SNOT-22 scores were assessed as a measure of CRS severity. The association between traffic proximity and SNOT-22 scores were determined using multiple linear regression.

Results:
There were 81 female and 100 male participants. The majority of participants were White not Hispanic (84.5%). On adjusted regression, there was a weak but significant direct association of increased traffic proximity with SNOT-22 scores ($\beta$: 0.003; 95% CI: 0.0003, 0.006; $p = 0.03$).

Conclusions:
Increasing traffic proximity, suggestive of higher levels of urbanization, population, and pollution, was significantly associated with increased severity of CRS. Based on these findings, exposure to pollution must be considered in management of CRS. Furthermore, future studies, comparing rural versus urban prevalence of CRS and how pollutants affect symptom severity, are needed to better elucidate the role the environment has in CRS.

Poster #C072

**Impacts of COVID-19 on US academic rhinologists' industry engagement**

Michael Warn
Daniella Chan
Theodore Nguyen, BS
Edward Kuan, MD, FARS
UC Riverside

Introduction:
The COVID-19 pandemic inflicted an economic downturn that likely diminished engagement between physicians and industry. We explored the fluctuations of industry funds received by US rhinologists from 2019-2021.

Methods:
Fellowship graduation year and 2019-2021 industry compensation from the CMS Open Payments database was collected for 180 fellowship-trained US rhinologists. Compensation was compared across years and between early and late career rhinologists.

Results:
Cohort revenue in 2019 ($2,221,709) declined 49.9% in 2020, only to recover to 73.4% of 2019 amounts by 2021. From 2019-2020, 64% of rhinologists experienced initial losses. By 2021, 17% experienced further loss, 41% recovered a portion of funds, while 42% were neutral by 2021, resulting in a net loss of $851,402 for those who initially lost funds. 19% of the cohort experienced initial gains from 2019-2020, with 68% experiencing delayed subsequent 2021 losses, while 32% gained additional funds. In the 17% of the cohort who did not initially experience any significant gain or loss from 2019-2020, 10% experienced subsequent 2021 losses, 45% experienced gains, and 45% remained neutral. The net cohort deficit by 2021 was $594,098. Compared with those in early career stages, more later (>10 yr) career rhinologists experienced losses from 2019-2020 (58% vs 42%), and subsequent 2021 losses, (45% vs. 36%, $p=0.033$). Later career rhinologists were less likely to recover previously lost funds (40% vs. 60%, $p=0.003$).

Conclusions:
The field of rhinology's industry engagement experienced downturn in financial compensation from 2019-2021, which did not recover. Losses occurred more frequently for late career rhinologists.

Poster #C073

**Improvement of Bruxism symptoms and its correlation with nasal symptoms after upper airway surgery**

Yusuf M. Gulleth, MD, MPH
Renu Paneru, Fellow
Peter Catalano, MD, FARS
St Elizabeth Medical Center, Steward Medical Group

This study aims to determine if patients with nasal obstruction and bruxism undergoing upper airway surgery will have postoperative improvement of bruxism, and if there is a correlation between the improvement of bruxism and sino-nasal symptoms.

Methods:
This is a prospective single arm non-blinded study involving pediatric and adult patients with undergoing nasal surgery which included one or a combination of; septoplasty, bilateral inferior turbinate reduction, Endoscopic sinus surgery, tonsillectomy and adenoidectomy. Participants filled 2 sets of questionnaires before and 3 months after surgery. The questionnaires were Nasal Obstruction and Septoplasty effectiveness scale (NOSE score) and Bruxism Symptoms Questionnaire (BSQ). The primary outcome measure is the change in the symptom scores of the 2 questionnaires pre and post operatively. Secondary outcome measure is the correlation of NOSE scores to BSQ score. Preliminary Statistical analysis included Student t tests, Wilcoxon signed rank tests and ANOVA were done using SPSS software.

Results:
20 patients completed the surveys. 7 males 13 females, Ages 6 to 62 years. There were 8 Pediatric patients aged 6-16 the rest were adults. There is a statistically significant improvement of both the Bruxism Symptom Questionnaire (BSQ) score and NOSE score ($p<0.005$) postoperatively. Pearson correlation testing did not indicate a significant positive correlation. Overall, 85% patients had improved bruxism symptoms, of those 45% had near complete resolution.

Conclusion:
Upper airway surgery improves Bruxism symptoms for majority of patients with surgical indications for sino-nasal symptoms. No significant correlation of postoperative NOSE and BSQ scores was detected.

Poster #C074
**WITHDRAWN**

Poster #C075
**Inferior turbinate flap for coverage of exposed ICA due to clival osteoradionecrosis**
Priyanka Bisarya, MD
Carol Yan, MD
Adam DeConde, MD
University of California, San Diego

Introduction:
Nasopharyngeal carcinoma (NPC) is treated with radiation for Stage I disease or concurrent chemoradiation for advanced disease. Recurrent NPC (rNPC) can undergo re-irradiation or endoscopic nasopharyngectomy to reduce radiation toxicity. Here we present a patient with rNPC treated with endoscopic nasopharyngectomy complicated by a non-healing nasopharyngeal wound with carotid exposure and clival osteoradionecrosis (ORN). He was treated with an extended axial inferior turbinate flap (PPITF). In the literature, the use of this flap has been limited to CSF leak repair; its use for non-healing bony and soft tissue defects of the lateral or posterior nasopharynx has not been described.

Case Presentation:
A 54-year-old male presented with a nasopharyngeal mass biopsied as nasopharyngeal carcinoma (EBV negative), Stage II cT1N1M0. He received cisplatin and proton beam radiation. A local recurrence rT1N0M0 was noted 1.5 years later. He underwent an endoscopic nasopharyngectomy with negative margins. This recovery was marked by a non-healing nasopharyngeal wound, nuchal rigidity, elevated inflammatory markers and imaging showing abnormal marrow enhancement concerning for clival ORN and less than 1 mm of soft tissue covering the right internal carotid artery (ICA). Given prior posterior septectomy and right inferior turbinate resection, the only intranasal reconstructive option was a left extended PPITF, a vascularized flap based off the inferior turbinate artery. The flap healed with complete ICA coverage. The osteomyelitis of the clivus resolved symptomatically and radiographically.

Discussion:
The extended PPITF is a viable alternative for carefully selected, non-healing, previously irradiated nasopharyngeal defects.

Poster #C076
**Influence of sinonasal pneumatization on frontal sinus inflammation in CRS**
Peiran Zhou, MD, PhD
Mohamed Aboueisha, MD
Ion Prohnitchi, MD
David Cvancara, BS
Ian Humphreys, DO
Waleed Abuzeid, MBBS, FARS
Aria Jafari, MD, FARS
University of Washington

Introduction:
Chronic rhinosinusitis (CRS) exhibits considerable heterogeneity due to a variety of known environmental and host factors. The role of individual sinonasal pneumatization patterns in the radiographic extent of disease, however, remains underexplored. Herein, we aim to investigate the influence of frontal sinus pneumatization on frontal sinus inflammation (FSI) in patients with CRS.

Methods:
A retrospective analysis was conducted of patients evaluated at our tertiary care rhinology clinic with clinical and computed tomography (CT) evidence of CRS, without prior endoscopic sinus surgery. Each CT's frontoethmoidal regions were classified according to The International Frontal Sinus Anatomy Classification (IFAC), and the narrowest anterior-posterior dimension (APD) of the frontal recess was measured.

Results:
Of the 40 patients assessed, inclusive of 80 frontoethmoidal regions, 27 (33.8%) demonstrated FSI on CT. Notably, the incidence of all IFAC cell types, including agger nasi (92.6 vs. 86.8%), supra agger (51.9 vs. 43.4%), supra agger frontal (22.2 vs. 15.1%), suprabullar (96.3 vs. 84.9%), suprabullar frontal (33.3 vs. 11.3%), supraorbital ethmoid (29.6 vs. 24.5%), and frontal septal (33.3 vs. 17.0%) cells, was higher in patients with FSI vs. those without. Additionally, the mean APD for the FSI group was significantly narrower (2.6 vs. 3.7mm; $p<0.0001$).

Conclusions:
This data implies that individuals with CRS exhibiting FSI demonstrate a higher prevalence of all IFAC cell types, and a narrower outflow tract compared to those without FSI. Future research involving larger cohorts and investigations into patient responses to medical and surgical treatments is underway.

Poster #C077
**Invasive fusariosis of the skull base mimicking a primary bone tumor: A case report**
Jen Li, Dong, BS
Ray Wang, Dr.
Meha Fox, MD

Objectives:
Invasive fusariosis (IF) is a rare and often fatal fungal infection, primarily affecting immunocompromised patients. Here, we present the first known case of IF presenting as an erosive skull base mass in an immunocompetent individual and its management with surgery and antifungal therapy.

Methods:
We conducted a comprehensive review of the patient's medical records for clinical course and management, as well as review of relevant literature.

Results:
Here we report an 80-year-old immunocompetent male who presented to otolaryngology for evaluation of an incidentally discovered right pterygopalatine fossa mass on computed tomography imaging. Further magnetic resonance imaging revealed that the mass was eroding superiorly into the sphenoid bone of the skull base. While initially concerning for a neoplastic process, an endoscopic endonasal incisional biopsy confirmed an invasive Fusarium oxysporum infection. The patient received dual antifungal regimen (IV amphotericin B and voriconazole) along with aggressive surgical debridement. The patient remained stable and was discharged on postoperative day 2 with a course of voriconazole. Repeat imaging at 6 months after surgery showed no recurrence of disease.

Conclusion:
A skull base mass in the pterygopalatine fossa in an individual with notable epidemiological exposure to molds may represent an atypical presentation of IF. This case underscores the importance of considering IF in skull base masses, even in immunocompetent individuals. Upon IF diagnosis, a swift multidisciplinary approach, combining antifungal therapy and aggressive surgical intervention may maximize positive outcomes. Early diagnosis and prompt management are crucial given the high mortality of IF.

Poster #C078
**Isolated fungal sphenoid sinusitis with lateral rectus palsy xix years post lung transplant**
Mallory Jenkins, BA
Nadia Tello
Winslo Idicula

Rhinocerebral mucormycosis is rare and occurs in those with diabetes or previous organ transplant. Common symptoms include facial pain/swelling, fever, rhinorrhea, nasal ulceration, and epistaxis. Mortality rates reach nearly 50%. Those with previous organ transplants typically present with sinus symptoms weeks to months after transplantation.

We present a rare case of a 75 year old male who presented with intermittent headache. Medical history was significant for bilateral lung transplantation in 2017. His headaches did not concern previous providers but on his fourth presentation he was admitted for further work up. Imaging showed small fluid levels within the right maxillary and sphenoid sinuses. Infectious work-up revealed no meningitis. On day three of hospitalization, the patient complained of diplopia on the right. Exam was significant for CN6 palsy. Repeat imaging was performed to rule out cavernous sinus thrombosis, dural venous sinus thrombosis, and rarer etiologies such as Tolosa-Hunt syndrome. Imaging showed increasing fluid levels of the right maxillary and sphenoid sinuses. ENT was consulted. Nasal endoscopy was significant for pink, vascularized mucosa with no regions of pallor or necrosis. Due to patient history, FESS was performed. Once again, there were no findings suggestive of invasive fungal species but thick mucus and purulence of the right sphenoid grew Rhizopus. The patient's CN6 palsy did not resolve and progressed to the contralateral orbit. His mentation declined. Repeat nasal endoscopy showed healthy mucosa while MRI showed enhancement worrisome for meningitis.

This is the only reported case of fungal sphenoid sinusitis resulting in CN6 palsy, meningitis, and death six years after transplant.

Poster #C079
**JNA in an adult resulting in intracranial cyst**
Patricia Loftus, MD, FARS
Evan Patel, MD
Yasmin Eltawil, BS
Shayan Fakurnejad
Kara Tanaka
Michael Huang

Background:
Juvenile nasopharyngeal angiofibromas (JNAs) are benign, vascular lesions which arise from one or more vascular pedicles in the nasal cavity. While they are almost exclusively found in adolescent males between the ages of 9 and 25, there are case reports of tumors presenting in older patients. JNAs exhibit benign histologic features on pathology but they may present with local invasion or even demonstrate intracranial progression in more aggressive lesions.

Methods:
A 31-year-old patient presenting with altered mental status who was found to have a JNA predominantly emanating from the right SPA but with multiple solid components and an intracranial cyst.

Results:
After pre-operative embolization, the patient was taken to the operating room for endoscopic resection of a large fibrous mass extending from the right sphenopalatine artery into the right nasopharynx, right maxillary sinus, bilateral sphenoid sinuses with obliteration of the inter-sinus septum, and through the bony medial orbital wall without invasion of the periorbita. The intracranial cyst was drained endoscopically through the right skull base dehiscence with expression of 20cc of mucopurulent fluid. His post-operative course was uncomplicated without any evidence of a CSF leak and with marked improvement in his mental status.

Conclusion:
We describe a rare case of an adult with a nasopharyngeal angiofibroma who presented with altered mental status and intracranial findings.

Poster #C080
**Laboratory measurements and sinus surgery**
Kevin Tie, MD
Christopher Brook, MD
David Caradonna, MD, FARS
Beth Israel Deaconess Medical Center

Background:
Limited data exists on the use of preoperative laboratory measurements to predict response to functional endoscopic sinus surgery (FESS). This study assessed whether preoperative C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), immunoglobulin E (IgE), and blood eosinophil percentage (EOS) can predict response to FESS as determined by postoperative intranasal steroid treatment.

Methods:
Adult patients at BIDMC from inception until September 8, 2023 with chronic rhinosinusitis with nasal polyps who underwent FESS and had CRP (n = 129), ESR (n = 79), IgE (n = 107), or EOS (n = 125) measured within four weeks prior were included. Labs were divided into normal (CRP: 0-5.0mg/L; ESR: 0-15mm/hr; IgE: 150-300UI/mL; EOS: 1-7%) and high groups (CRP: >5.0mg/L; ESR: >15mm/hr; IgE: >300UI/mL; EOS: >7%). The primary outcome compared between the normal and high groups was need for intranasal normal saline steroid irrigations after FESS (≤4 weeks, 4-12 weeks, 12-26 weeks, 26-52 weeks, 1-3 years, 3-5 years, and >5 years).

Results:
Elevated IgE required intranasal steroid irrigation at 1-3 years (normal 34%, high 62%, p = 0.02), 3-5 years (normal 24%, high 48%, p = 0.04), and >5 years (normal 19%, high 43%, p = 0.02). Elevated EOS required intranasal steroid irrigation at 26-52 weeks (normal 7%, high 25%, p = 0.009) and >5 years (normal 19%, high 46%, p = 0.005). CRP and ESR were not predictive of postoperative intranasal steroid treatment.

Conclusions:
Elevated IgE and EOS (but not CRP or ESR) may predict need for chronic intranasal steroid treatment after FESS.

Poster #C081
**Lamb septum as a model for septoplasty training**
Heather Yeakel, MD
James D Kintzing
Eric D. Johnson
Jacob A. Kintzing
David M. Yen, MD

Introduction:
Septoplasty is one of the most common rhinologic procedures and is challenging to teach due to limited access and visualization. The use of 3-D printed replicas or cadaveric human tissue has been reported but both are costly. Lamb septum has recently been proposed as a model. Here we assess the lamb septum model for equivalence to cadaveric human tissue and cost.

Methods:
Lamb and human cadaver cartilaginous and soft tissue components were analyzed for mean cartilage thickness, mean mucosa thickness, mean Young's Modulus, mean puncture force, and length, height and cost. Subjective assessment of the anatomic and physical properties of the model was also performed.

Results:
The mean cartilage thickness for the lamb and human tissue was 2.28 ± 0.54 mm and 1.45 ± 0.54 mm respectively. Mean mucosa thickness was 0.52 ± 0.15 mm for the lamb and 1.9 ± 0.51 mm anterior-superior and 0.8 ± 0.42 mm inferior for human. Mean Young's Modulus was 1.92 ± 0.54 MPa and 2.03 ± 1.30 MPa respectively. Mean puncture force for lamb vs. human was 1.36 ± 0.17 lbf and 0.68 ± 0.24 lbf. Mean length was found to be 3.5 ± 0.3 cm for the lamb and 3.31 ± 0.53 cm for human tissue. Mean height was found to be 2.3 ± 0.3 cm and 2.99 ± 0.47 cm for the lamb and human tissue. Subjective otolaryngologist assessment of the lamb and human tissue showed equivalence of the lamb cartilage thickness and stiffness while mucosal thickness was determined to be more fragile. Cost of the lamb model was $25 and human cadaver was $1000.

Conclusion:
Mounted lamb septum is an excellent model for septoplasty education. Human cadaver and 3-D printed models have been used, but lamb septum is reasonably equivalent, easy to procure, and inexpensive.

Poster #C082
**Lefort surgery and post-operative septal abnormalities**
Ashley Schemel, MD
Adam Kimple, MD, PhD, FARS
Gregory Capra, MD, FARS

Introduction:
Lefort I surgery utilizes areas of weakness in the maxilla to reposition the mid-face. These changes to the sinonasal cavity have been shown to disrupt the continuity of the lateral nasal sidewall, but limited research is available on changes to the septum. This ongoing prospective trial will further characterize septal abnormalities and correlate clinically.

Methods:
We performed a prospective trial to evaluate the incidence and impact of rhinosinusitis in individuals 18 to 65 years old following orthognathic surgery utilizing a Lefort 1 osteotomy approach. Nasal Obstruction Symptom Evaluation (NOSE) was obtained before surgery as well as at 3, 6, and 12 months. Computed Tomography (CT) scans to evaluate septum angulation and septal perforation were also performed before and 3 months postoperatively.

Results:
17 total patients have been evaluated. 52% of patients had worsening septal deviation, calculated by the angle of the septum on CT scan. Septal deviation was identified most commonly at the maxillary crest (59%), followed by the anterior aspect of the cartilage (40%). 47% of patients were found to have a septal perforation on postoperative CT scan. NOSE scoring worsened after the procedure, with a peak at 6 months, but was not found to be statistically significant.

Conclusion:
Almost half of those evaluated were noted to have new or worsening septal deviation as well as new septal perforations. However, given no statistically significant change in NOSE scores, it is difficult to evaluate for clinical significance. Given this preliminary data, continued recruitment and evaluation is critical to further characterize these abnormalities and clinical correlation.

Poster #C083
**Lefort surgery role in chronic rhinosinusitis**
Ashley Schemel, MD
Adam Kimple, MD, PhD, FARS
Gregory Capra, MD, FARS

Introduction:
Lefort I is the most common orthognathic surgery, repositioning the midface for a more favorable dental occlusion. However, the result of these surgeries also changes the nasal airway, maxillary sinus cavities, and can damage the mucosal lining. We frequently see patients after Lefort I advancements and sought to understand how this procedure affects sinonasal symptoms.

Methods:
We performed a prospective trial to evaluate the incidence and impact of rhinosinusitis in individuals 18 to 65 years old following orthognathic surgery utilizing a Lefort 1 osteotomy approach. Computed Tomography (CT) scans were collected before and 3 months after surgery. Sino-Nasal Outcome Test (SNOT-22) were collected before and at 3, 6, and 12 months after surgery.

Results:
We present preliminary results from the initial 17 total patients. CT scans showed 64% had worsening Lund Mackay scoring, from a range of 1 to 3 points. SNOT-22 scoring showed gradual worsening overtime, with statistically significant worsening at 12 months at $p=0.0433$.

Conclusion:
The 17 patients evaluated thus far Lefort 1 procedures demonstrated progressively worsening rhinosinusitis on the SNOT-22 and on CT scans with Lund Mackay scoring. We will continue accruing patients for this study to help further elucidate the sinus sequela of Lefort 1 orthognathic surgery.

Poster #C084

**Machine learning analysis of reddit sinusitis forum**

Najm Khan, MBS
Aatin Dhanda, BA
Dominique Paderin, Medical Student
Christopher Tseng, Resident
Rayaan Khan, Student
Masayoshi Takashima, MD, FARS
Omar Ahmed, MD, FARS
Houston Methodist Hospital

Introduction:
Reddit, a popular social media platform well situated for healthcare topics due to an emphasis on content over self-promotion. The sinusitis “subreddit” has reached approximately 10,000 subscribers in 4 years. Here we use machine learning to perform an analysis of reddit posts to identify major topics of discussion and concern related to sinusitis.

Methods:
An automated webcrawler was used to extract all posts from the Sinusitis “subreddit” in August 2023. Engagement metrics were collected. Posts were individually characterized into categories based on dominant theme, and summarization with natural language processing was used to generate the top 10 posts best representing each category.

Results:
The most frequently discussed topics were symptoms of sinusitis (27.5%), followed by medical treatments (17.4%), surgical treatments (13.7%), home remedies (9.5%), information sources/searching for resources (6.4%), risk factors and pathogenesis of disease (6.3%), patients’ frustrations (6.1%), and psychological symptoms experienced by patients related their sinusitis (5.3%). Less frequently discussed posts pertained to other elements of sinusitis (4.3%), diagnostic modalities (2.8%), and finally, forum moderator posts (0.04%). Pathogenesis/risk factor related posts garnered the highest mean upvotes (17.62, SD: 26.67), and surgical treatments had the highest mean comments (20.31, SD: 15.98).

Conclusion:
On a popular social media sinusitis forum, top topics included symptoms and treatments. Patients also expressed frustration or sought out support, and a notable proportion discussed psychological symptoms attributed to sinusitis. These results provide patient insights and can aid in guiding physician patient discussions.

Poster #C085

**Malignant transformation of sinonasal and middle ear inverted papilloma: A case report**

Eve-Marie Roy, MD
Emily Wang, Dr.
Marilou Piché, Dr.
Sylvie Nadeau, Dr.
Geatan Fradet
Université Laval

Background:
Inverted papilloma (IP) is a rare benign tumor typically found in the sinonasal track. Few cases of inverted papilloma with middle ear invasion have been described. These tumors tend to be more aggressive and has a higher tendency for malignancy.

Objectives:
We present a case of IP with malignant transformation and extension to the middle ear following the eustachian tube. We aim to review existing literature on this entity and to compare our management approach with the current standard of practice.

Case presentation:
A 61-year-old male with a past medical history of IP in the left nasal cavity presented in May 2023 with a mass in the same area. Biopsy of the mass proved local recurrence of the tumor. The patient also complained of hearing loss and a granuloma was biopsied in the left ear and proven to be squamous cell carcinoma in situ. An MRI revealed tissue occupying the external canal, the tympanic cavity and mastoid antrum with bony erosion. The patient underwent concurrently a temporalectomy, mastoidectomy and an endoscopic sinus resection of the malignant squamous cell carcinoma. The patient received radiotherapy and chemotherapy following the surgery.

Conclusion:
Our study is one of the first clinical reports showing a case of malignant transformation of a sinonasal IP in the middle ear and auditory canal. The tumor in this study was located primarily in the nasosinus few years before. There is still a lack of data concerning the migration hypothesis of the middle ear from the nasosinusal area. Some studies suggested that the cellules might migrate from the Eustachian tubes. Hence, our study might assist in enabling further research on this subject.

Poster #C086
**Management of anterior epistaxis - Cost analysis comparing Rapid Rhino and Merocel**
James Fowler, MD
Leigh Sowerby, MD

Background:
Epistaxis affects 60% of the population over their lifetime. When conservative attempts fail, nasal tampons are often required to stop anterior bleeds. Both Mercel and Rapid Rhino are popular non-dissolvable nasal tampons. The objective of this study is to compare the total cost of Merocel versus Rapid Rhino from a provincial payer and an academic hospital perspective.

Methods:
Retrospective review of patients presenting with epistaxis in 2018. Two sites compared. Merocel was solely available at one site, and Rapid Rhino was available and preferentially used at the other. Patients were followed for two-weeks to capture rebleed events. Cost-analysis was complete from a provincial and hospital perspective capturing direct and indirect costs.

Results:
The rate of rebleed with Merocel was 42% compared to 24% with Rapid Rhino. Statistical analysis revealed a non-significant difference in costs per patient for Rapid Rhino ($61.61, 95% CI: -$127.84 to $251.05) from the hospital perspective as well as the provincial health care payer perspective ($78.14, 95% CI: -$89.54 to $245.83).

Conclusion:
Although Rapid Rhino is more expensive per unit, our study suggests there is no significant difference in costs between the two products for treatment of epistaxis. Our study implies that higher upfront costs of Rapid Rhino, relative to Merocel, has been offset by fewer rebleeds and representation to the emergency department.

Poster #C087
**Mantle zone lymphoma: A rare presentation of extranodal involvement in the orbital apex**
Kue Lee, BS
Asim Ahmed
Ishan Aggarwal
Camillo Reyes, MD, FARS

Introduction:
Mantle zone lymphoma (MZL) is a rare variant of B-cell non-Hodgkins lymphoma characterized by a t(11;14) chromosomal translocation. Clinical characteristics include lymph node enlargement, B-symptoms, splenomegaly, and involvement of extranodal organs such as the spleen, GI tract, and bone marrow. Here, we present a rare case of extra-orbital malignancy associated with MZL that initially presented with progressive right-eyed vision loss.

Study Design:
Case Report with literature review

Results:
A 58-year-old black female presented with progressively worsening vision loss of the right eye. Given the lack of pain in EOMs and the progressive nature of vision loss, atypical optic neuritis was suspected. She was advised to admit herself to the ED where a full ophthalmology work-up was completed and she was consequently put on methylprednisolone. Given a family history of multiple sclerosis, an MRI was ordered along with CT of the brain, face, neck, orbit, and C-spine with and without contrast. Findings revealed a mass compressing the right optic nerve. Orbital decompression was performed, after which steroids were resumed and vision improved. Pathology results revealed malignancy consistent with MZL, and the patient was started on rituximab. Patient is still undergoing treatment, but is overall doing well.

Conclusion:
When clinical presentation of vision loss does not lead to a definitive diagnosis, further work-up may be necessary to consider metastatic systemic disease as the etiology. While rare, MZL can metastasize to the orbit, presenting as a myriad of ophthalmologic symptoms inconsistent with any one particular diagnosis, including gradual, painless unilateral vision loss.

Poster #C088

**Marijuana and chronic rhinitis in the all of US database**

Aatin Dhanda, BA
Sai Phani Ram Popuri, Masters Student
Najm Khan, Clinical Research Fellow
Lexi Goehring, Medical Student
Renjie Hu, Professor
Masayoshi Takashima, MD, FARS
Omar Ahmed, MD, FARS
Houston Methodist Hospital

Introduction:
The relationship between cannabis use and chronic rhinitis (CR) remains unclear. The All Of Us research program is a large, population-based cohort designed to represent a diverse United States population. Here, we explore the frequency of cannabis usage and its effect on chronic rhinitis using All of Us.

Methods:
The All of Us database was queried for adult patients with any lifetime marijuana usage, and who answered survey questions regarding frequency of use in the last 3 months. Cohorts included never, once or twice, daily, weekly, monthly. The database was further queried for patients with two diagnoses of rhinitis to ensure coding validity. Demographic information and comorbidities were collected. Univariate and multivariate analyses were performed within the database platform.

Results:
95,002 patients were identified with data regarding marijuana use over a 3-month period, between 2017 and 2022. 3127 rhinitis patients were identified in this cohort, with a mean age of 58.7 years (SD: 15.03). 67.0% of CR patients were female, and 30.4% male. The relative risk of CR, compared to never users in once or twice users; 0.65 (95% CI: 0.58-0.72), monthly users 0.6 (95% CI: 0.49 -0.75), weekly users 0.62 (95% CI: 0.51-0.75), and daily users 0.58 (95% CI: 0.5-0.68).

Conclusions:
Any marijuana use was found to be associated with a lower prevalence of CR, with daily users having the lowest proportion. Further study is needed to understand the mechanism underlying the effects of cannabis on sinonasal physiology.

Poster #C089

**Metachronous development of bilateral silent sinus syndrome over a 7-year period**

Hye Rhyn Chung
Jessa Miller, MD
Jeffrey Suh, MD, FARS
UCLA David Geffen School of Medicine

Introduction:
Silent sinus syndrome (SSS) is a rare entity characterized by enophthalmos and hypoglobus in the setting of ipsilateral maxillary sinus atelectasis that occurs almost exclusively in a unilateral fashion. We report a case of bilateral SSS that developed sequentially over a 7-year period.

Methods:
A literature search on SSS was conducted using PubMed and Google Scholar. The epidemiology, presentation, diagnosis, treatment, and outcomes of SSS were reviewed.

Results:
A 62-year-old female presented to a tertiary center rhinology clinic with postnasal drip and nasal airway obstruction. She denied vision changes, facial trauma, and surgery. Nasal endoscopy revealed retraction of the right uncinate process and a right septal deviation. A sinus computed tomography (CT) scan demonstrated opacification of the right maxillary sinus and collapse of the right maxillary sinus walls and orbital floor. The remainder of the paranasal sinuses were normal. She was diagnosed with right SSS and underwent right maxillary antrostomy and septoplasty. She did well postoperatively until she developed recurrent headaches 7 years later. A subsequent sinus CT scan demonstrated a clear right maxillary sinus with a patent antrostomy and interval opacification of the left maxillary sinus with collapse of the maxillary sinus walls, consistent with left SSS. Unilateral SSS is an uncommon entity, and bilateral SSS is even more rare, with only a few case reports in the literature.

Conclusion:
We present a unique case of metachronous bilateral maxillary SSS which occurred over a 7-year period. Treatment of SSS involves restoration of sinus ventilation with maxillary antrostomy and management of enopthalmus and hypoglobus is warranted in severe cases.

Poster #C090
**Modified Caldwell-Luc approach to intra-antral pathology**
Brady Anderson
Joseph Camargo
Scott Graham, MD, FARS
Douglas Kendrick

Background:
The sublabial approach to the maxillary sinus provides exposure for various intra-antral pathologies. Predictable sequelae including oroantral fistula, maxillary sinusitis, and facial asymmetry, coupled with the advent of endoscopic surgery have greatly decreased the frequency of its clinical use.

Typically, the sublabial approach to anterior antrostomy is closed with suture approximation of soft tissue. We describe two cases of en bloc removal of the anterior maxillary wall for removal of intra-antral pathology, with reconstruction using contemporary plating methods.

Case 1:
In a 13-year-old female, an enlarging intramaxillary ameloblastic fibro-odontoma obliterated the maxillary sinus causing pain and facial swelling. An extensive antero-lateral maxillary window was opened for wide tumor exposure. Following resection, resorbable plates and pins were used to replace the anterior maxillary face. An iliac crest graft was plated to reconstruct the alveolar defect.

Case 2:
A 48-year-old woman presented with a large bony cystic lesion of the maxillary floor. An anterior maxillary window was outlined, with titanium micro midface plates affixed to the bone flap before osteotomy completion. After osteotomy and cyst removal, the bone flap was replaced using the previously placed plates.

Discussion:
We describe a novel modified Caldwell-Luc approach with anterior maxillary wall replacement. This can potentially provide a barrier to infection, wound breakdown, and facial distortion. Further research is needed to examine long-term effects and benefits.

Conclusions:
Anterior maxillary wall plating after modified Caldwell-Luc surgery restores functional healing after removal of extensive intra-antral pathology.

Poster #C091
**Monoclonal antibodies and allergic fungal sinusitis**
Mihai Bentan, BA
Graham Pingree, Medical Student
Lawrance Lee, Dr.
Thomas Fitzpatrick, Dr.
Theodore Schuman, MD, FARS
VCU School of Medicine

Introduction:
Monoclonal antibodies (mAbs) targeted to type 2 helper T-cell (th2) cytokines (dupilumab, mepolizumab) and IgE (omalizumab) have been utilized to control sinonasal inflammation and coincident lower airway inflammatory disease in patients with allergic fungal sinusitis (AFS). These medications have been proposed as steroid- and surgery-sparing modalities, although their precise effects on the incidence of functional endoscopic sinus surgery (FESS) in large datasets remains unknown.

Methods:
The TriNetX Analytics Research Network was queried for each mAbs's market lifespan through September 2023 for patients with AFS. Patients were Propensity Score Matched to non-mAb controls based on age, race, sex, nasal polyps, and asthma. Outcomes included the absolute risk reduction (ARR) of undergoing FESS, readmission, and emergency department (ED) visit.

Results:
Dupilumab significantly reduced FESS risk (ARR 7.9%, 95% CI 3.5%-12.4%, $p<0.001$), admission risk (ARR 15.6%, 95% CI 9.6%-21.7%, $p<0.001$), and ED risk (ARR 11.6%, 95% CI 5.2%-17.9%, $p<0.001$) versus controls. Mepolizumab had no impact on FESS risk (ARR 4.3%, 95% CI -2.3%-10.9%, $p=0.199$), admission risk (ARR 3.8%, 95% CI -6.2%-13.8%, $p=0.458$), or ED risk (ARR 2.2%, 95% CI -8.0%-12.3%, $p=0.677$). Similarly, omalizumab had no impact on FESS risk (ARR 0.4%, 95% CI -4.9%-5.6%, $p=0.894$), admission risk (ARR 4.3%, 95% CI -3.9%-12.5%, $p=0.304$), or ED risk (ARR 0.4%, 95% CI -7.9%-8.7%, $p=0.933$).

Conclusion:
Using TriNetX, dupilumab exhibited superior outcomes in AFS versus mepolizumab or omalizumab. Further study of the individual roles of these mAbs in AFS patients is necessary.

Poster #C092

**Nasal septal hybrid perineurioma-schwannoma tumor**

Timothy Fan, MD
Heather Yeakel, Dr.
Jason Ohlstein, Dr.
Omar Ahmed, MD, FARS
Alexander Limjuco, MD
St. Luke's University Health Network

Introduction:
Benign peripheral nerve tumors (BPNT) are traditionally classified as neurofibromas, perineuriomas, or schwannomas. Recent advancement in immunohistochemistry analysis propelled the formation of a fourth category, hybrid tumors, which exhibit combined characteristics of the three traditional classes. The incidence of intranasal BPNT is low, with no report of hybrid BPNT in the nasal cavity or paranasal sinuses present in the literature. This report describes the first case of nasal septal perineurioma-schwannoma tumor (PST) with CHD9:VGLL3 gene fusion. By demonstrating the clinical presentation, treatment plan, and postoperative course for our patient, the authors hope to bring awareness to this rare entity and to enhance future workup and treatment algorithms for intranasal hybrid BPNT.

Methods:
This is a case report of a 61-year-old female with nasal septal PST with CHD9:VGLL3 fusion.

Results:
With chronic postnasal drip as her only symptom, our patient was found to have a right nasal septal mass on exam and underwent computed tomography (CT) and magnetic resonance imaging (MRI) assessment. Biopsy result demonstrated a PST with CHD9:VGLL3 fusion. She underwent total resection and reported improvement in postnasal drip with no tumor recurrence two months post operation.

Conclusion:
While BPNTs are generally indolent in nature, their connection to potential genetic mutations makes accurate diagnoses critical for patient's health. Clinical presentation is nonspecific for BPNT, and CT, MRI, and biopsy are crucial components of evaluation. CHD9:VGLL3 fusion is a unique marker for identifying PST. Complete resection with negative margin is important to prevent recurrence and/or malignant transformation of PST.

Poster #093

**Nose goes? A case of mucocutaneous leishmania**

Osama Hamdi, MD
Anne Getz, MD, FARS
University of Colorado

Leishmaniasis, a protozoal infection, typically presents as cutaneous, mucocutaneous, or visceral forms. Nasal and nasopharyngeal leishmaniasis is a rare manifestation, often challenging to diagnose and manage. Herein, we present a case of a 55-year-old male Sudanese refugee who presented to the ED with a two-year history of a gradually erosive nasal lesion on his septum and columella. The lesion caused moderate pain, persistent headaches, occasional bleeding, and purulent drainage, and was accompanied by odynophagia, night sweats, and weight loss. The exam revealed the extent of the disease as erosion of the entire cartilaginous septum posteriorly, laterally contained by the lateral walls of the nasal ala, and anteriorly completely eroding the columella with involvement of the philtrum. Bedside debridement revealed heaps of granulated tissue and ulceration. Flexible laryngoscopy revealed an exophytic lesion in the hypopharynx. Labs and CT/MRI of the face were negative. The differential diagnosis included infectious etiologies such as leishmaniasis, non-tuberculous mycobacteria, and leprosy, as well as non-infectious causes such as malignancy and granulomatosis with polyangiitis. Biopsies and cultures were positive for leishmaniasis. The Internal Medicine, Infectious Disease, and ENT teams proposed a treatment course of Amphotericin and serial endoscopic exams and debridement by ENT to assess the efficacy of treatment, with planned facial reconstruction at least 1 year after treatment resolution. This case highlights the importance of interdisciplinary collaboration, frequent endoscopic monitoring, and serial examinations for tracking treatment response in patients with disseminated leishmaniasis.

Poster #C094

**Novel virtual reality simulator for sinonasal and skull base surgery**

David Ahmadian, BS
Jason Zhang, Mr.
Shireen Samargandy, MD
Christopher Le, MD, FARS
Eugene Chang, MD, FARS
University of Arizona, College of Medicine – Tucson

Introduction:
Several challenges exist in teaching sinonasal and skull base (SSB) anatomy. First, radiographic-based education relies on 2D identification of 3D structures. Second, observing endoscopic surgeries can be confusing to novice surgeons as they passively navigate the skull base. Third, the clinical correlation of these structures and their proximity to major blood vessels and intracranial structures is not formally taught in surgery. We hypothesized that an immersive virtual reality (VR) sinus and skull-base curriculum would address these challenges among otolaryngology and neurosurgical residents.

Methods:
2-dimensional CT and MRI images from a de-identified patient were segmented and converted into 3-dimensional VR image. We developed three teaching modules: 1. Free form module, to navigate and understand spatial locations of SSB structures. 2. Surgical module, to dissect endonasal structures to expose the pituitary fossa. 3. Quiz module, to self-test knowledge on SSB structures and clinical function. This VR curriculum was tested locally in our training program and nationally at the AAO-simulation conference for face and construct validity.

Results:
Residents and surgeons had positive feedback and felt that the images enhanced their SSB anatomy and surgical awareness of structures. However, some users felt lost due to the use of VR. We therefore developed a tutorial and narration to provide step-by-step guidance which greatly enhanced learning in novice VR users.

Conclusion:
VR simulation provides trainees a self-directed immersive platform to understand SSB anatomy and their relevance in surgery. This tool should be used as an adjunct to traditional teaching to overcome hurdles for technical adoption.

Poster #C095

**NSQIP analysis of endoscopic sinus surgery outcomes before and during the COVID-19 pandemic**

Sherron Thomas, BSA
Helen Shi
LeeAnna Lui
Emily Hunt
Christina Fang, MD
Albert Einstein College of Medicine

Background:
Many elective cases of endoscopic sinus surgery (ESS) for chronic rhinosinusitis were delayed during the COVID-19 pandemic. ESS posed a unique concern due to the potential of aerosolized transmission of SARS-Cov-2 particles originating in the upper airway. We aim to study the impact of the COVID-19 pandemic on case volume and outcomes of ESS.

Study Design:
This cross-sectional study encompassed all elective cases of ESS between 2017-2020, utilizing data from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database. Patient demographics and postoperative outcomes were compared from 2020 to the years preceding the pandemic using univariate analysis.

Results:
ESS case volume decreased by 20.0% from 2019 to 2020. There was a significant increase in the age of patients in 2020 compared to preceding years (IQR: 32-61 vs. 36-66 years, $p = 0.041$). There was a significant decrease in outpatient cases and a significant increase in inpatient cases (67.6% vs. 50.0%, 32.4% vs 50.0%, $p < 0.001$). There were greater occurrences of postoperative deep vein thrombosis (DVT) and thrombophlebitis (0.0% vs 0.9%, $p = 0.025$). No significant differences were observed in comorbidities, American Association of Anesthesiology classification, surgical complications, and postoperative 30-day outcomes following the onset of the pandemic.

Conclusions:
There was an expected decrease in elective ESS cases during the COVID-19 pandemic. The significant increase in the occurrence of DVT and thrombophlebitis suggests a possible need for increased vascular screening in the context of COVID-19 prevalence. This study reinforces the idea that ESS continues to be a generally safe surgical procedure.

Poster #C096

**Nuances in secondary management of iatrogenic cerebrospinal fluid leak**

David Lerner, MD
Helene Chesnais, Medical Student
Alan Workman, MD
Jennifer Douglas, MD
Michael A. Kohanski, MD
Nithin D. Adappa, MD, FARS
James N. Palmer, MD, FARS
University of Pennsylvania

Introduction:
Iatrogenic cerebrospinal fluid (CSF) leaks are rare complications associated with functional endoscopic sinus surgery (FESS) that require secondary management when primary repair cannot be accomplished. There is a variety of factors to consider during secondary management of an iatrogenic CSF leak.

Methods:
We performed a retrospective chart review of consecutive patients with FESS performed at outside facilities that underwent secondary repair of iatrogenic CSF leak at our institution over a period from 2009 to 2023.

Results:
Twenty-two patients met criteria for study inclusion. The average patient age was 53.5 years with mean BMI of 29.2 kg/m2. An updated computed tomography (CT) scan was obtained for all patients, and magnetic resonance imaging (MRI) was obtained for 12 patients (54.5%). A nasoseptal flap (NSF) was used for repair in 14 patients (63.6%) and free mucosal grafts were used in the remaining 8 patients (36.3%). Bone grafts were utilized in 4 cases (18.2%). A lumbar drain was placed in 6 patients (27.2%). Acetazolamide was started in all 3 patients with BMI greater than 35 kg/m2. No patient demonstrated CSF leak post-operatively.

Conclusion:
Secondary management of iatrogenic CSF leak must be tailored to the individual patient. We routinely obtain an updated fine-cut CT scan to assess for site of injury, prior repair material, and occult intracranial bleeding. We perform MRI in cases of suspected parenchymal injury. Vascularized NSFs were used for larger or more challenging reconstructions, and bone grafts were used for significant bony defects. We place a lumbar drain both to identify injury site and for CSF diversion. We routinely initiate acetazolamide in patients with BMI greater than 35 kg/m2.

Poster #C097

**Odds of epistaxis in AFib patients on oral anticoagulation vs. LAAO**

Shreya Mandloi, BS
Kathryn Nunes
Elliott Sina
Peter Benedict, MD
Chase Kahn, MD
Alexander Duffy, MD
Samuel R. Shing
Zachary Urdang
Elina Toskala, MD, PhD, FARS
Mindy Rabinowitz, MD, FARS
Gurston Nyquist, MD, FARS

Background:
Anticoagulants (AC) are associated with epistaxis in atrial fibrillation (AF) patients. Left atrial appendage occlusion (LAAO) is a treatment that allows AF patients to stop AC. This study explores the epistaxis odds following LAAO versus novel oral anticoagulants (NOAC) and warfarin.

Methods:
The TriNetX database was queried for AF patients on a NOAC, warfarin, or treated with LAAO. Epistaxis odds ratios were compared 1-day to 6-months and 6-months to 3 years following initiation of NOAC, warfarin or LAAO. Records of LAAO patients at our institution were reviewed.

Results:
From the TriNetX query, 826 patients received LAAO, 522,239 patients on NOAC and 299,102 patients on warfarin were included. From 6-month to 3 years after treatment initiation, LAAO patients had reduced odds of epistaxis compared to warfarin patients (OR:0.47 p=0.035). There was no difference in odds of epistaxis between LAAO and NOAC patients. NOAC patients had reduced odds of epistaxis when contrasted with warfarin patients 1-day to 6-month (OR:0.75 p<0.0001), and 6-month to 3 years after initiation (OR:0.82 p<0.0001). In 12 patients from our institution, epistaxis on AC was an indication to receive LAAO. Following LAAO, epistaxis severity improved significantly in all 12 patients (p<0.0005) and in 8/12 patients epistaxis completely resolved (p=0.06).

Discussion:
LAAO decreased the severity and frequency of epistaxis in AF patients on warfarin. Our institutional experience demonstrates long-term improvement in epistaxis after LAAO for NOAC patients. LAAO should be considered as a treatment option for AF patients with refractory epistaxis. Additional studies need to be performed to account for dual antiplatelet following LAAO on epistaxis.

Poster #C098
**WITHDRAWN**

Poster #099
**Olfactory and gustatory dysfunction, the neglected senses in thyroid disease**
Rashida Chatani, BA
Jeb Justice, MD
Gonzalo Acosta Garcia, MD

Objective:
Chemosensory dysfunction, such as anosmia, hyposmia, ageusia and hypogeusia, is known to negatively impact the quality and longevity of life of affected patients. Hypothyroidism has been associated with olfactory and gustatory dysfunction in adult patients. The purpose of this review is to summarize the existing literature regarding hypothyroidism and chemosensory function and highlight the need for further research in this area.

Data Sources:
PubMed, Web of Science, Embase

Review Methods:
The search included years from 1975 to present. All peer-reviewed primary articles published in and outside of the United States were eligible for inclusion in the study. Eligibility assessment was performed by two reviewers.

Results:
Of the 150 records identified, 29 full texts were retrieved for review and 11 studies remained in the final review. Studies included human and animal trials. Chemosensory dysfunction was measured by sniffen sticks, QSIT, taste strips and research specific parameters. Five articles investigated the effects of levothyroxine in alleviating smell and taste loss resulting from hypothyroidism.

Conclusion:
This study summarizes the current literature on chemosensory dysfunction in patients with hypothyroidism. Hypothyroidism has been postulated as a cause of smell and taste dysfunction in several publications. However, available data is scarce and further studies are needed to more precisely establish the link between these two entities.
Keywords:
Chemosensory dysfunction, olfaction, olfactory dysfunction, hypothyroidism.

Poster #C100

**Optimizing care in chronic rhinosinusitis patients: Diagnostic factors and surgical interventions**

Manisha Naganatanahalli
Ravi Dhamija, BS
Claudia Cabrera, MD
Kenneth Rodriguez, MD
Brian D'Anza, MD
Case Western Reserve University, School of Medicine

Introduction:
Chronic rhinosinusitis (CRS) often necessitates surgery, requiring a grasp of diagnostic and demographic factors for optimal patient care. This study explores the interplay of initial diagnosis, rates of surgical intervention based on initial diagnosis, and follow-up adherence.

Methods:
A retrospective review was conducted of adult patients (n = 1,239) who presented to a tertiary rhinology clinic between 2017-2019. After exclusion, the final group consisted of 886 patients. Categorization of patients' initial chief complaints was done according to the major and minor sinus criteria.

Data:
Of 886 patients included in this analysis, 649 were asked to follow up after the first visit, and 360 (55.6%) of these patients complied with the follow up instructions. During the second visit, of the 360 patients, 208 were asked to follow up. From those, 115 (55.3%) came back for a third visit. Of the patients who were asked to follow up during the initial visit, 64.6% of patients self reported to having sinonasal symptoms upon initial presentation and 11.9% of patients self reporting other non-major sinus symptoms. These trends continued at the third visit as well, with patients who arrived to clinic with a sinonasal chief complaint being the predominant patient population. Additionally, of the analyzed 886 patients, 109 underwent sinus surgery. Of these 109 patients, 86% of them arrived to clinic with at least 1 major sinus category complaint, with sinonasal symptoms being the predominant complaint in this category at 66.7%.

Conclusion:
These findings underscore the importance of early detection and management of sinonasal symptoms, as they appear to be a significant driver of surgical intervention.

Poster #C101

**Orbital exenteration in rhino orbital IFS in COVID-19 patients**

Kue Lee, BS
Victoria Huynh
Diana Bigler, Resident
Camillo Reyes, MD, FARS

Objectives:
Rhino Orbital Acute Invasive Fungal Sinusitis (RO AIFS) is an aggressive infection that affects immunocompromised states. Orbital exenteration is an invasive surgical option. During the COVID pandemic, many individuals were affected by RO AIFS due to short-term steroid use. Our study focuses on systematically reviewing published literature on the utility of orbital exenteration in such COVID patients.

Methods:
Twenty-eight studies were included and analyzed for medical and surgical treatment, comorbidities, and demographic factors. Chi-Square, Phi-coefficient, and t-test were used to identify correlations between COVID and orbital exenteration use.

Results:
Of 101 included patients, 67 (66.3%) had COVID. Previous steroid use was significantly higher in COVID(+) patients ($p < 0.001$). Orbital Exenteration was significantly less used for COVID(+) patients ($p = 0.005$) and patients with previous steroid use ($p = 0.002$). Type of antifungal used did not affect if orbital exenteration was performed. The most common comorbidity in COVID(+) patients was type 2 diabetes ($p = 0.024$). Other comorbidities included type 1 and 2 diabetes, HIV, and prior steroid use. COVID(+) patients generally had 1.69±.53 comorbidities and significantly higher comorbidities ($p < 0.001$).

Conclusion:
Orbital exenteration is generally not used in patients with previous steroid use. This is a novel finding as prior steroid use is a known risk factor for invasive courses of RO AIFS. Steroid use in COVID causes a reversible immunocompromised state that leads to a RO AIFS that can be managed without an invasive procedure. Future studies should consider the short-term immunocompromised state of steroid use in COVID patients when managing RO AIFS.

Poster #C102

**Outcomes of shared decision-making among Chinese Americans with chronic rhinosinusitis**

Kevin Hur, MD
Jaynelle Gao
Benjamin Tam, Medical Student
Kevin Herrera
Neil Parikh
Amila Adili
Melissa Wilson
Dale Rice, MD
Bozena Wrobel, MD, FARS
Shinyi Wu
Keck School of Medicine of University of Southern California

Background:
There has been limited research on the influence of race and ethnicity on treatment decision-making for chronic rhinosinusitis (CRS). This prospective study aims to investigate potential factors linked to the choice of treatment modality among patients with refractory CRS, distinguishing between Chinese American and non-Chinese American individuals.

Methods:
CRS patients with persistent symptoms despite prior medical treatment were prospectively enrolled. These patients chose either to continue medical treatment or to opt for endoscopic sinus surgery (ESS) to alleviate CRS symptoms. Demographic and clinical characteristics were compared using bivariate analysis. The association between ethnicity and treatment modality choice was assessed using multivariable logistic regression.

Results:
Among the 134 patients (29.1% Chinese Americans) included, 79 patients (59.0%) elected to undergo ESS. No significant differences in demographics, nasal polyp status, comorbidities, Lund-Mackay, Sinonasal Outcome Test (SNOT-22), or modified Lund-Kennedy scores were found between the treatment groups. Chinese American patients reported a lower SNOT-22 score (32.03 ± 17.78) compared to non-Chinese Americans (43.29 ± 21.55; p=0.005). After adjusting for patient's age, income, and SNOT-22 score, non-Chinese American patients were more inclined to select ESS (Odds Ratio(OR) = 7.92; 95% CI: 2.95-21.28; p<0.001) as opposed to Chinese American patients.

Conclusions:
Chinese American patients with refractory CRS were less likely to opt for ESS compared to their non-Chinese American counterparts. Further investigations are warranted to uncover factors contributing to surgical hesitancy among Chinese American CRS patients.

Poster #C103

**Outcomes of skull base surgery vs age**

Sarit Dhar, BS
Dhruv Kothari, Resident
Sanjeet Rangarajan, MD, FARS

Background:
Age is an important determinant of health and predictor of procedural outcomes. Patients of all ages with skull base tumors may need to undergo transnasal endoscopic skull base surgery, which has several associated complications.

Objective:
To determine if a disparity exists in surgical outcomes for patients <65 years old with skull base tumors compared to patients ≥65 years old with skull base tumors within a single healthcare system.

Methods:
Retrospective analysis using the TriNetX database in one healthcare system compared the outcomes of two cohorts: Cohort 1, composed of 120 patients <65 years old who underwent nasal endoscopic surgery for skull base tumors, and Cohort 2, composed of 30 patients ≥65 years old who underwent nasal endoscopic surgery for skull base tumors. The following outcomes were analyzed within 180 days after surgery: meningitis, diabetes insipidus (DI), epistaxis, cerebrospinal fluid (CSF) leak, and visual changes.

Results:
Results are presented as a risk ratio with 95% confidence interval (RR [95% CI]). Preliminary analyses show Cohort 2 at a significantly increased risk for epistaxis (0.250 [0.115, 0.545]) and visual changes (0.250 [0.115, 0.545]). There was no significant difference in risk of meningitis, DI, or CSF leak.

Conclusion:
This analysis highlights the increased risk of post-surgical epistaxis and visual changes in older patients who underwent nasal endoscopic surgery for skull base tumors. Otolaryngologists should counsel older individuals on this risk during the shared decision-making process, and pay close attention to these patients to prevent epistaxis and optic nerve injury intra and peri-operatively.

Poster #C104

**Patient perspectives on expert consensus criteria for chronic rhinosinusitis disease control**

Ryan Cotter, BS
Ahmad Sedaghat, MD
Katie Phillips, MD
University of Cincinnati College of Medicine

Background:
Recently, a set of consensus criteria and near-consensus criteria for the evaluation of chronic rhinosinusitis (CRS) disease control was identified by a multidisciplinary expert panel. The objective of this study is to evaluate patient perspectives on these disease control criteria, including whether additional criteria were needed.

Methods:
This is a qualitative phenomenological study using constant comparative methodology. Ten one-on-one interviews, ranging from 5 to 12 minutes and based on a semi-structured script, with CRS patients of diverse backgrounds were performed. The authors identified recurrent themes in patient responses and have made conclusions based on these themes.

Results:
Most participants agreed with the consensus (overall symptom severity, nasal obstruction severity, patients' self-assessed CRS control and need for CRS-related oral corticosteroids) and near-consensus (nasal endoscopy, smell loss and nasal drainage severities, activity impairment, and overall quality of life) items identified by the expert panel. Patients reaffirmed the importance of having an item that assessed their overall symptom severity and emphasized the importance of items pertaining to nasal symptoms and impact of CRS on day-to-day activities. One theme that emerged was the need for a question about facial pain/pressure.

Conclusions:
CRS patients overwhelmingly affirmed recently described consensus and near-consensus criteria for CRS disease control with the caveat that a question asking about facial pain/pressure should be included as well. Recently identified consensus criteria for CRS disease control should be interpreted within the context of patient perspectives.

Poster #C105

**Peak nasal inspiratory flow and the impact of dupilumab in patients with severe CRSwNP**

Martin Desrosiers, MD
Scott Nash, Dr.
Andrew Lane, MD, FARS
Stella Lee, MD
Eugenio De Corso, Dr.
Changming Xia, Dr.
Juby A. Jacob-Nara, Dr.
Harry Sacks, MD
Paul Rowe, Dr.
Yamo Deniz, Dr.
University of Montreal, Canada

Background:
Lack of nasal airflow is recognized as a high burden of disease for patients with chronic rhinosinusitis with nasal polyps (CRSwNP). This post hoc analysis evaluated the effect of dupilumab on peak nasal inspiratory flow (PNIF) and other outcome measures in patients with CRSwNP and limited baseline PNIF (<120 L/min) in the SINUS-24 and SINUS-52 trials (NCT02912468/NCT02898454).

Methods:
PNIF was assessed in patients treated with dupilumab 300 mg or placebo every 2 weeks in the pooled SINUS-24/SINUS-52 population. PNIF and other CRSwNP outcome measures were analyzed to Week 24 in patients with baseline PNIF <120 L/min.

Results:
Of 724 patients in the pooled intention-to-treat population, 76% had PNIF <120 L/min at baseline. By Week 24, dupilumab improved PNIF versus placebo with least-squares mean difference of 41.2 L/min (95% CI 33.8, 48.5). The odds ratio for achieving a ≥20 L/min PNIF improvement with dupilumab versus placebo was 4.68 (95% CI 3.18, 6.88). Dupilumab significantly improved nasal polyp score, loss of smell, nasal congestion/obstruction, SNOT-22, UPSIT, and LMK-CT scores versus placebo by Week 24 (all analyses P<0.0001).

Conclusion:
In patients with limited nasal airflow, dupilumab improved PNIF, leading to an improved nasal airflow, and improved other objective and subjective CRSwNP outcome measures versus placebo.

Poster #C106
**Pediatric endoscopic skull base surgery: Safety, efficacy, and lessons learned**
Daniel Lander, MD, MSCI
Peter Yang, Pediatric Neurosurgery Fellow
Kate Dunsky, Assistant Professor
Michael Chicoine, Chair of Neurosurgery
David Limbrick, James W. and Frances G. McGlothlin Chair, Department of Neurosurgery
John Schneider, MD
Washington University School of Medicine

Objective:
To describe our institution's experience with pediatric endoscopic skull base surgery, to review its safety and efficacy, and to discuss lessons learned.

Methods:
A retrospective review of pediatric patients who underwent endoscopic skull base surgery between 10/30/2016-5/5/2023 at an academic, tertiary-care center.

Results:
In total, 35 surgeries were performed in 30 patients: 30 primary surgeries and 5 revision surgeries. Median patient age was 12 years (range 22 months to 18 years) with slight female predominance (N=18, 60%). Surgery was performed for pituitary adenomas (N=12, 34%), CSF leak repair (N=5, 14%), craniopharyngiomas/Rathke's cleft cysts (N=3, 9%), meningiomas (N=2, 6%), JNAs (N=2, 6%), inverted papillomas (N=2, 6%), vision loss due to malignant osteopetrosis (N=2, 6%), and aneurysmal bone cysts (N=2, 6%), among other pathologies. Bifrontal craniotomy was required in 2 cases in addition to endoscopic approach. Intraoperative MRI was utilized in 10 cases (29%). Nasoseptal flap was used in 19 cases (54%) and CSF diversion was performed in all cases with intraoperative CSF leak (N=16, 46%). Median length of hospital stay was 5 days; a single postoperative CSF leak required revision surgery and 3 patients developed postoperative intracranial infections (9%). The most common endocrinopathy developed after surgery was transient DI (N=6, 17%). There were no cases of internal carotid artery injury, new cranial neuropathies or vision loss after surgery.

Conclusions:
Endoscopic skull base surgery is a safe and efficacious intervention for pediatric patients. A multidisciplinary team, thoughtful pre-operative and peri-operative decision-making, and surgeon experience are key for optimal outcomes.

Poster #C107
**Pediatric sinusitis complications- An update**
Christine Settoon, MD
Mark Rizzi
Adva Buzi

Introduction:
The COVID-19 pandemic altered patterns and frequent illnesses commonly treated by otolaryngologist in the inpatient setting leading to less hospitalizations and utilization. However during the Winter 2022-2023 season, admissions for complicated sinusitis and surgical interventions increased at our quaternary academic pediatric hospital.

Objectives:
Explore the pattern of pediatric complicated sinusitis management including admissions and surgical rates before, during, and after the COVID-19 pandemic.

Methods:
A retrospective chart review of patients younger than 18 years old admitted with a clinical diagnosis of sinusitis with complication (orbital or intracranial) between the dates of January 1, 2017 and August 31, 2023. Clinical characteristics, including demographics, microbiology results, antibiotic type and duration as well as follow up were collected and analyzed. Univariate and multivariate analysis was conducted.

Results:
264 patients met criteria; the median age was 7 years with a male predominance (67%). Total admissions for sinusitis peaked in January 2023 with surgical rates peaking in December 2022. Admissions and surgical rates during the Winter 22-23 season were 38% higher than similar dates in the Winter 19-20 season. Epidural abscess was the most common intracranial complication; Streptococcus intermedius in the majority of cases. Cases were then divided into pre-COVID and post-COVID groups for secondary analyses. There was no difference in demographics, length of stay, surgical rates, and microbiology results.

Conclusion:
There was an increase in sinusitis admissions, surgical interventions, and intracranial complications during the Winter 2022-2023 season compared to before COVID.

Poster #C108

**Peri-operative management patterns following endoscopic transsphenoidal pituitary surgery**

Dhruv Kothari, MD;
Sarit Dhar, Clinical Research Fellow
Kaitlynne Pak, MD
Jordan Kai Simmons, MD
Dennis Tang, MD, FARS
Sanjeet Rangarajan, MD, FARS
Cedars Sinai Medical Center

Introduction:
This study aims to address limited literature on peri-operative regimens following endoscopic transsphenoidal surgery (ETSS) for pituitary tumors by investigating the most common peri-operative treatment regimen at a single institution.

Methods:
Using the TriNetX Live database, we identified a cohort undergoing ETSS for pituitary tumors between January 2014 and October 2023 (n=260) and analyzed rates and types of pain control, intranasal sprays, antibiotics, hormonal replacement (HR), and anti-coagulation within 14 days.

Results:
Peri-operatively, 96.2% and 88.5% of patients were given opioid and non-opioid pain medications, respectively. Intranasally, saline (73.1%) and oxymetazoline (19.2%) were most common, while fluticasone use was rare (<3%). The most common antibiotics were 1st-3rd generation cephalosporins (50%), topical bacitracin or mupirocin (38.5%) and vancomycin (7.7%). For HR, 53.8%, 34.6% and 23.1% of patients required glucocorticoids, desmopressin, and levothyroxine, respectively. Finally, 42.3% of patients were given heparin or enoxaparin.

Discussion:
The most common peri-operative regimen within 14 days of ETSS included multimodal pain control, saline spray, glucocorticoids and cephalosporins. Given post-operative hypopituitarism rates vary from 5-25%, this study demonstrates a possible increased need for HR stewardship following ETSS, and greater awareness about the potential risks of excessive hormone replacement, including hypercortisolism, thyroid storm, hyponatremia, and fluid overload. Further studies addressing the limited data on the rates of both HR related adverse events following ETSS and complications when comparing peri-operative regimens are warranted.

Poster #C109

**Perioperative predictors of Dupilumab initiation after prior endoscopic sinus surgery**

Christina Dorismond, MD, MPH
Mason Krysinski, MD
Yash Trivedi
Rory Lubner, MD
Rakesh Chandra, MD, FARS
Naweed Chowdhury, MD, MPH
Justin Turner, MD, PhD, FARS

Background:
Dupilumab has increasingly been used in the treatment of chronic rhinosinusitis with polyps (CRSwNP), but factors associated with dupilumab initiation are understudied. Our goal was to identify perioperative factors that may predict initiation of dupilumab after endoscopic sinus surgery.

Methods:
We performed a prospective cohort study of patients with CRSwNP who underwent endoscopic sinus surgery at a tertiary academic medical center from 2015-2023. Patients who initiated dupilumab postoperatively were identified. We compared demographic and perioperative variables, medical comorbidities, and cytokine levels from intraoperative mucus samples between those who initiated dupilumab and those who did not. Fisher's exact test and Mann-Whitney U tests were used for analysis.

Results:
Of the 303 patients who met inclusion criteria, 62 (20.5%) initiated dupilumab postoperatively. Median time to postoperative dupilumab initiation was 18.5 months (interquartile range 5-37.5). Statistically significant predictors of dupilumab initiation included female gender, asthma, allergic rhinitis, preoperative anti-leukotriene inhibitor use, increased preoperative Lund MacKay score, high mean eosinophil counts per high-power field, elevated IL-13 levels, and high 3-month postoperative SNOT-22 scores ($p < 0.05$).

Conclusion:
Patients who are started on dupilumab postoperatively have greater comorbidities and perioperative disease severity. These factors may represent clinical predictors for dupilumab initiation, though further research is needed into factors associated with dupilumab success in this population.

Poster #C110
**Pilot analysis of marketing techniques for a tertiary otolaryngology clinic**
Rose Dimitroyannis, BA
Christopher Roxbury, MD, FARS

Background:
Hospital systems utilize large amounts of funding to market their clinical programs. It is not well known how successful these campaigns are at increasing patient awareness and generating office visits. The objective of this study was to analyze if hospital system marketing is effective in generating patient referrals and to determine methods for increasing patient outreach.

Methods:
A Redcap survey evaluating the referral process for a tertiary otolaryngology practice was distributed to patients in the waiting area via QR code. Questions assessed how patients heard about the clinic.

Results:
Of 62 patients, 37 (59.7%) were referred by physicians, 73.0% (27/37) of whom were from within the hospital system. Ten (16.1%) patients were referred by friends or colleagues, two (3.2%) participants heard about the clinic through internet advertisements, and two (3.2%) heard about the clinic due to living locally. Nine patients (14.5%) heard through other manners, such as research study participants and familiarity with the hospital due to relationships with other specialists. The mean patient income from zip code data was $71,252 (SD= 30,550). Patients whom physicians referred had significantly lower median income by zip code than patients who came to the clinic via other means ($p<0.05$).

Conclusion:
This analysis suggests that a majority of patients in a tertiary otolaryngology clinic are internal physician referrals, with lower-income individuals being more reliant on physician referrals. Only 3.2% of patients heard about the clinic through advertisements, suggesting marketing campaigns are responsible for generating only a minority of patient visits.

Poster #C111
**Pneumosinus dilatans from aggressive intracranial pressure**
Taylor Erickson, MD
Christine Glastonbury, MD
Steven Pletcher, MD

Pneumosinus dilatans is a rare condition of abnormal expansion of the paranasal sinuses and has been associated with intracranial lesions, cerebral hemiatrophy, chronic rhinosinusitis, and congenital hydrocephalus. The current report describes a patient who developed pneumosinus dilatans of the frontal and ethmoidal sinuses two years following aggressive intracranial pressure management. 23-year-old female with a history of a motor vehicle accident underwent craniectomy complicated by hydrocephalus requiring cranioplasty and ventriculoperitoneal shunt placement. Two years post-procedure, the patient presented with progressive obtundation. Her imaging findings demonstrated interval expansion of the frontal and ethmoidal sinuses and significant cranial shift. In an effort to improve her neurologic status, she underwent bifrontal cranialization of the frontal sinuses with neurosurgery which was complicated by persistent intracranial connection to her ethmoid sinuses. Upon consultation, our otolaryngology service performed endoscopic closure of these skull base defects to decrease infectious risk. Reports that have previously attributed this phenomenon to intracranial pressure management are rare and have been associated with congenital hydrocephalus. Researchers have proposed that intracranial hypotension can cause sinus hyperaeration via a negative pressure effect. To our knowledge, this is the first report to describe a case of secondary pneumosinus dilatans after two years of ventriculoperitoneal shunt placement thought to be secondary to aggressive intracranial pressure management. Identification of this phenomenon and its association with intracranial pressure management is important to direct appropriate and timely management.

Poster #C112
**WITHDRAWN**

Poster #C113
**Predicting visual acuity recovery in orbital decompression surgery for dysthyroid optic neuropathy**
Forrest Fearington
Lazaro Peraza, Resident
Andrew Awadallah, Medical Student
Gabriel Hernandez-Herrera, Medical Student
Lilly Wagner, Consultant
Janalee Stokken, MD, FARS

Background:
A small percentage of patients with thyroid eye disease will develop dysthyroid optic neuropathy (DON). If first-line therapy with high-dose corticosteroids does not yield an adequate response, orbital decompression surgery may be pursued. While many studies have described a successful return of best corrected visual acuity (BCVA) after decompression surgery, few have investigated what risk factors can predict long-term BCVA.
Aim: To determine preoperative factors that predict long-term postoperative BCVA in patients with DON.

Methods:
We conducted a retrospective chart review of 36 patients (n=63 eyes) who underwent orbital decompression surgery (endoscopic or transantral) for DON. Relevant patient data was collected including preoperative comorbidities, time to surgery after DON diagnosis, and pre- and post-operative BCVA (recorded as logMAR(minimum angle of resolution), where smaller values indicate better BCVA). Linear regression analysis was performed to identify risk factors predictive of final BCVA.

Results:
Preoperative BCVA was significantly associated with final BCVA after surgery ($p < 0.001$). Patients with a preoperative BCVA less than 0.20 achieved an average final BCVA of 0.14 (n=23 eyes, IQR 0.2), with 87.0% of patients reaching a final BCVA of at least 0.3. Patients between 0.21 to 0.70 preoperative BCVA achieved a final BCVA of 0.25 (n=28, IQR 0.20), with 78.6% at 0.3 or better. Patients greater than 0.7 preoperative BCVA reached a final BCVA of 1.00 (n=12, IQR 1.30), with 25% at 0.3 or better. Average followup across all patients was 13.6 months.

Impact: These findings inform providers and patients of the expected vision improvement after orbital decompression for DON based on preoperative BCVA.

Poster #C114

**Prescribing practices and barriers of biologics for chronic rhinosinusitis amongst otolaryngologists**

Chris Bell, MD, MPT
Andrew Thamboo, MD
Eric Monteiro, Associate Professor
Jonathan Yip, MD
University of Calgary

Objectives:
The use of biologics on patients with CRSwNP is a newer practice and there is limited data on physician and patient experiences outside of clinical settings. The goal of this study was to gain a better understanding of these experiences including referral and prescribing practices, patient factors which guide prescription, and patient and patient-reported issues which might limit prescription of biologic medications.

Methods:
A survey was distributed to attending otolaryngologists using the Canadian Society of Otolaryngology (CSO) email distribution and eSurvey program. Responses were tabulated for the entire cohort and compared between rhinologists and non-rhinologists where appropriate. Frequencies and proportions were expressed as a percentage of total respondents. Fisher's exact test was used for statistical analysis between groups.

Results:
A total of 79 total survey responses were recorded (22 rhinologists and 57 non-rhinologists). Significantly more rhinologists reported prescribing biologic medications on their own (100% vs 50%; p <.001) with a higher proportion of patients on biologics compared to non-rhinologists (p=.023). More rhinologists appear to consider poor response to medical therapies, need for rescue steroids and other type 2 therapies than non-Rhinologists, but also experience poorer support from patient support programs and less availability to medications. All respondents feel cost is a severely limiting factor for patient use of biologic medications.

Conclusion:
Rhinologists appear to be more comfortable with biologic medication use and prescription compared to non-Rhinologist colleagues. Both groups of survey respondents feel cost is a significant factor.

Poster #C115

**Primary surgery outcomes: Modified Lothrop vs Draf 2a/b**

Shiv Maharaj, MD
Roy Casiano, MD, FARS
University of Miami

Background:
Frontal sinusitis management is challenging, particularly in patients with polyps, multiple frontal cells, or frontal neo-osteogenesis. In select cases, we performed primary Draf 3 procedures. There is a paucity of data comparing outcomes of primary Draf 3 to other less invasive Draf procedures.

Objectives:
Compare Draf cohorts' preop Lund-Mackay score (LMS) and the pre/post-op SNOT-22, Lund-Kennedy Scores (LKS), and complication rates.

Study Design:
Retrospective Cohort Study

Methods:
IRB approved study on primary Draf 2a-Draf 3 CRS from 2020-2023. Pre-op and 3-month post-op LMS, LKS, and SNOT-22 were reviewed. One-way ANOVA compared preop scores, and repeated measures ANOVA evaluated change in preop and post-op scores. Pearson's $\chi 2$ and Fisher's exact tests evaluated cohort differences.

Results:
The cohort included 124 patients: 13 Draf 2a, 80 Draf 2b, and 31 Draf 3. Ethnic distribution: 20% Black, 78% White, and 40% Hispanic. There was no difference in sex or race across cohorts. Polyps were more prevalent in the Draf 2a: 75%, 2b: 56%, Draf 3: 59%. Mean preop LMS (p=0.13) and LKS (p=0.38) were similar across cohorts. Preop SNOT-22 was not statistically different but was clinically significantly different between 2b and 3 (p=0.16): 2a=36±19, 2b=43±24, Draf 3=33 ±21. Mean decrease in SNOT-22 post-op was 42% (p<0.01) and this was different across groups (p=0.02): 2a=38%, 2b=60%, Draf 3=29%. The mean decrease in LKS post-op was 57% (p<0.01); 2a=73%, 2b=47%, Draf 3=51%. Complications occurred in 11 patients overall (p<0.01): 2a=39%, 2b=4%, 3=10%.

Conclusion:
Primary modified Lothrop is well-tolerated with significant improvement in SNOT-22 and LKS score and a low complication rate.

Poster #C116
**Protein expression patterns in sinonasal mucus in primary and secondary chronic rhinosinusitis**
Heidi Martini-Stoica, MD, PhD
Adam Kimple, MD, PhD, FARS
Brent Senior, MD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
Brian J. Thorp, MD, FARS
Cristine Klatt-Cromwell, MD
Matthew Lelegren, MD
Saima Wase, MS
Aurelia S. Monk, BS
Abdullah Zeatoun, Postdoctoral Fellow Researcher
Scott Hardison, MD
UNC

Background:
Chronic rhinosinusitis (CRS) is a common clinical syndrome that results in significant morbidity and cost. CRS can be divided by etiology into primary and secondary CRS. Secondary CRS is generally excluded from studies; however, much can be learned from better understanding the pathophysiology of secondary causes of CRS such as cystic fibrosis (CF) and primary ciliary dyskinesia (PCD). We present data to help better understand CF related CRS and PCD related CRS.

Methods:
Cytobrushes were utilized to collect sinonasal mucus from the middle meatus. Mucus samples underwent mass spectrometry for unbiased protein identification. Samples were collected from individuals with: PCD (n=8), CF (n=11), CRS without nasal polyps (CRSsNP) (n=11), CRS with nasal polyps (CRSwNP) (n=9), Allergic Fungal Sinusitis (AFS) (n=3), Aspirin Exacerbated Respiratory Disease (AERD) (n=10), Allergic Rhinitis (AR) (n=10), and healthy control (n=7).

Results:
Protein expression data demonstrates a type 2, eosinophilic, endotype in CRSwNP, AERD, and AFS with statistically significant increased expression relative to controls of T2 proteins such as CLCa1, ALOX15, and CLC. Conversely, PCD demonstrated decreased expression in many of these T2 proteins. PCD, as well as CRSsNP demonstrated a neutrophilic, T3 endotype, with statistically significant increased expression in MPO, GCA, IL8, and SAA2. This expression pattern was notably absent in CRSwNP.

Conclusion:
Overall, this study demonstrates samples collected from this procedure recapitulate endotypes previously associated with CRSwNP and CRSsNP and that PCD has enrichment of neutrophil associated proteins. These findings may help better characterize the molecular pathogenesis of PCD.

Poster #C117
**PRP for extremely long term anosmia: A case report**
Esther Wang, BS
Zara Patel, MD, FARS
The University of Chicago

Introduction:
We present a case of improvement in olfaction with platelet-rich plasma (PRP) after extremely long-term trauma-induced anosmia.

Case Description:
A 73-year-old male presented with a 45-year history of anosmia. In 1976, he sustained a skull base fracture. He noted complete loss of olfaction and gustation as well as phantosmia. Over the years, he tried theophylline, cilostazol, zinc, vitamin A and B6, alpha-lipoic acid, florical, and Mag-Ox, budesonide rinses, and olfactory training, with improvement of phantosmia but no improvement in anosmia.

At time of presentation to our clinic, on the University of Pennsylvania Smell Identification Test (UPSIT), he correctly identified only 12/40 odors. Nasal endoscopy and CT imaging showed clear sinuses and lack of obstruction to the olfactory cleft.

We discussed the treatment of COVID-19-related olfactory loss with PRP injections to the olfactory cleft, with full disclosure and counseling that due to the different etiology and duration of loss, it was unlikely any intervention would be able to help. Despite this, the patient wished to schedule PRP injections.

After finishing the series of three PRP injections, the patient correctly identified 19 odors on UPSIT with significant subjective improvement for the first time in 45 years. He was extremely grateful we allowed him to try this treatment option despite our doubts it would help him.

Discussion:
To our knowledge, this is the first report of success in treating post-traumatic OD with this series of PRP injections and the first time any intervention has been able to help someone with this extremely extended duration of loss. This suggests PRP could be a potential treatment option for many etiologies and durations of OD.

Poster #C118
**PuraGel versus ChitoGel in vitro**
Jennifer Mulligan, PhD
Maria Villanova, Lab Technician
Sufiya Ali
Brian Lobo, MD, FARS
Jeb Justice, MD, FARS
University of Florida

Background:
Chitogel and PuraGel (RADA16) have both been promoted to improve wound healing and promote hemostasis. Chitogel, which contains chitosan, is found in the cell walls of crustaceans, fungi and insects. PuraGel is a 16-amino acid sequence containing repeated R (positively charged arginine), A (hydrophobic alanine), and D (negatively charged aspartic acid) amino acid residues. For both compounds, it is unclear their impact when applied apically to ciliated, human sinonasal epithelial cells in vitro. As such, in these studies we focused on the placement, safety and immunogenicity of each compound.

Methods:
Human sinonasal epithelial cells from patients having skull base surgery were cultured in the air liquid interface for 21 days. Chitogel was mixed according to the manufacturer's instructions. PuraGel does not require preparation. Both were applied in 100 µl ribbons across the transwells and inserted by a fellowship trained endoscopic skull base surgeon via a 1 ml syringe. Apical LL37 and C3a (measured by ELISA), were used for immunogenicity and basolateral LDH for injury.

Results:
PuraGel stayed in place where applied and showed no indication of inducing cell injury via LDH secretion. Conversely, Chitogel was no longer in a visible ribbon after 6 hours and showed statistically increased basolateral LDH secretion. C3a, which is important in protection from infections, was lowered by only Chitogel but was unchanged with PuraGel. Neither compound stimulated LL37 secretion.

Conclusion:
PuraGel stays where placed and does no induce cell injury, while Chitogel does not stay in place, induces cell injury and alters apically available levels of C3a

Poster #C119
**Quantifying post nasal drip**
Aatin Dhanda, BA
Isuru Somawardana, Medical Student
Najm Khan, Clinical Research Fellow
Aayush Sharma, Medical Student
Yin You, Professor
Apurva Thekdi, Professor
Jeffrey Vrabec, Professor
Masayoshi Takashima, MD, FARS
Omar Ahmed, MD, FARS
Houston Methodist Hospital, Houston, Texas

Introduction:
Postnasal drip (PND) is a bothersome yet prevalent rhinitis symptom, and is thought to be comprised of both physical drainage and possible aberrant chemosensory components. Our objective is to compare patients' perceived symptoms of PND with objective endoscopic findings of post-nasal drainage.

Methods:
26 PND and 13 control patients (no symptoms of PND) were prospectively enrolled in the senior author's rhinology practice from March to September 2023. Two board certified otolaryngologists, blinded to chief complaint, graded rigid nasal endoscopy videos recorded during office visits. Patients were not sprayed with oxymetazoline or lidocaine to preserve PND conditions.
PND was graded on a Likert scale (0 (none) - 4 (severe drainage)) at the adenoid bed, soft palate portion of the nasopharynx, posterior septum, inferior aspect of the inferior turbinate, and middle meatus. Demographics and comorbidities were recorded. For PND patients, a 0-5 subjective level of perceived PND at time of endoscopy was collected. Mann-Whitney U test, chi-square analysis, and analysis of variance tests were used as appropriate.

Results:
Cohorts did not differ significantly in baseline characteristics of age, race or sex. In patients complaining of PND, subjective perception of PND was not significantly correlated to endoscopic exam. Mean otolaryngologist quantified PND at all 5 nasopharynx sites was not significantly different between cohorts of patients complaining of PND and controls ($P>0.05$).

Conclusion:
Perceived and visualized PND are not significantly correlated. These results suggest a noteworthy chemosensory component for patients complaining PND, and may have implications for treatments aimed at reducing secretions.

Poster #C120
**Radiographic variants in AFRS**
Dylan Erwin, MD
Mason Krysinski, MD
Matthew Liu
Alexander Choi, MD
Bundhit Tantiwongkosi
Philip Chen, MD, FARS
UT Health San Antonio

Background:
Allergic fungal rhinosinusitis (AFRS) often results in expansion of disease beyond the paranasal sinuses, which may put important structures, such as the anterior ethmoid artery (AEA), at risk for injury during endoscopic sinus surgery (ESS). The objective of this study was to compare the AEA to skull base (AEA-SB) length in patients with AFRS versus chronic rhinosinusitis with nasal polyps (CRSwNP).

Methods:
A single institutional retrospective chart review of patients undergoing ESS for AFRS and CRSwNP was performed. AEA-SB length were compared between the two groups. Other anatomic variants, including Keros measurement and presence of supraorbital ethmoid air cells (SOEC), concha bullosa (CB), Onodi cells, and Haller cells were measured and compared between the two groups.

Results:
Twenty-one patients were included in each cohort. The AFRS group was younger in age ($p = 0.015$) and had a significantly longer AEA-SB length ($p = 0.014$) compared to the CRSwNP group. No significant differences were observed between the two groups regarding Keros measurement and presence of concha bullosa, Haller cells, Onodi Cells, or SOEC. No association was seen between AEA-SB length and Keros length in either group.

Conclusion:
AFRS harbors anatomical differences compared to CRSwNP, with the former having a longer AEA-SB length. This key difference should be considered in the preoperative planning to prevent inadvertent injury to the AEA in patients undergoing ESS for AFRS.

Poster #C121
**Relationship of acute invasive fungal rhinosinusitis with SARS-CoV2: A meta-epidemiological analysis**
Estephania Candelo, MD, MSc
Anyull D. Bohorquez Caballero, MD
Oriana Arias Valderrama, MD, MSc
Angela M. Donaldson, MD, FARS
Mayo Clinic

During the COVID-19 pandemic, secondary fungal infections were recognized as a relevant cause of morbidity and mortality among patients recovering from SARS-CoV2. These patients have been described as having a propensity to develop acute invasive fungal rhinosinusitis (AIFRS) due to a possible dysregulation of the innate immune system. We aim to assess the incidence and associated risk factor (RR) of developing AIFRS in this population.

We identified observational studies assessing the incidence AIFRS including systematic reviews and meta-analyses. An umbrella review approach was conducted from 2020 to 2022 to identify those studies describing AIFRS in SAR-CoV2 infection. We estimated the incidence and pooling risk ratio (RR) of AIFRS by using the random effect of variance model and heterogeneity measurement with confidence intervals based on non-central chi-square.

A total of 167 studies were identified, and 64 abstracts were evaluated. From these, 7 studies met inclusion criteria. A total of 5695 participants were analyzed, 1:2.4 M:F ratio, median age 51.8 years old. The most frequent comorbidities were diabetes mellitus (DM), hypertension, and chronic kidney disease. Our analysis showed an AIFRS pooled incidence in patients with DM and without DM of 0.79 and 0.20, respectively. The umbrella review calculated a pooled RR of SARS-CoV2 infection and concomitant DM of 2.58 (95% CI: 2.53 to 2.64) and the attributable risk of DM to AIFRS during the SARS-CoV2 infection was 0.95.

SARS-CoV2 infection may not increase the incidence of developing AIFRS. DM could act as a confounding factor contributing to the AIFRS and SARS-CoV2 association. A marked increase in incidence was found only in those with DM and post or coexistent S

Poster #C122
**Relationship of estrogen exposure and sinonasal symptoms in women**
Snehitha Talugula, BS
Anthony Dick
Margaret Chervinko, MFA, MLIS
Victoria Lee, MD
University of Illinois at Chicago

Background:
Rhinitis and chronic rhinosinusitis (CRS) are inflammatory-driven processes. Previous research has shown an influence of sex hormones on inflammatory processes, including asthma. The purpose of this scoping review was to assess the existing epidemiologic literature looking at the relationship of estrogen on sinonasal symptoms in women.

Methods:
PubMed was searched with “estrogen,” “rhinitis,” and “female,” along with related terms. All English language articles examining the relationship between estrogen changes and sinonasal symptoms in women were included; case reports were excluded. Data collected included hormonal exposure, presence of sinonasal symptoms, and influence of hormonal exposure on symptoms.

Results:
28 studies were included. Two studies examined the effect of hormonal replacement therapy on sinonasal symptoms in healthy and rhinitis patients. Thirteen studies (12 in rhinitis, 1 in CRS) examined the effect of endogenous estrogen (menstrual cycle phases, oral contraceptive use) on disease incidence and severity, and 13 examined the effect of pregnancy on rhinitis incidence and disease severity. The data was conflicting: 17 articles found higher estrogen levels were associated with increased rhinitis incidence and disease severity, whereas 11 found no significant correlation or the opposite finding.

Conclusion:
The majority of the epidemiologic literature assessed the impact of estrogen on sinonasal symptoms in rhinitis with only one study looking at CRS; the data overall was conflicting. Further studies exploring the influence of estrogen on sinonasal symptoms in rhinitis, and in particular CRS, are needed to gain a better understanding of their impact on sinonasal symptoms/disease.

Poster #C123
**Revisional FESS rates for CRS between inmates and free world patients**
Kue Lee, BS
Nicholas Fuchs
Camillo Reyes, MD, FARS
Diana Bigler, Resident

Background:
Studies show that inmates are less healthy secondary to socioeconomic, environmental, and behavioral factors, complicated by limited healthcare expenditure in prisons. Surgical management is a crucial, expensive treatment for Chronic Rhinosinusitis (CRS) via endoscopic sinus surgeries (ESS) for favorable outcomes. There is minimal literature regarding increased revisional endoscopic sinus surgeries in inmate populations compared to civilians. Our study compares revision rates, comorbidities, and management between these cohorts to determine if revisional rates are higher in inmates and how this increases the economic healthcare burden.

Methods:
Augusta University’s discharge database was used to identify Georgia correctional facility inmates and civilians with diagnostic and procedure codes involving CRS and ESS. Demographic and perioperative course data were collected through manual chart review. Chi-squared test and t-test were performed with $p < 0.05$ considered significant.

Results:
The inmate and comparison groups consisted of 49 (mean age: 41.2±14.2) and 113 cases (mean age: 52.05±19.8), respectively. Comorbidities studied were diabetes, obesity, hypertension, asthma, and smoking. Inmates (0.63±0.81) had a lower comorbidity rate than civilians (1.27±1.00) ($p < 0.001$). There was no difference in sinus surgical history, type of perioperative steroids, or type of antibiotics used. Post-operatively, inmates had a significantly higher revisional rate compared to civilians (20.4% v 8.8%, $p = 0.040$).

Conclusion:
Inmates undergoing ESS for CRS had increased revisional rates compared to civilians. Increased need for surgical management in prisoners leads to increased economic healthcare burden.

Poster #C124
**Rhinitis medicamentosa exacerbation**
Cassidy Anderson, BS
Tracy Cheung, Medical Student
Geena Jung, Medical Student
Natalie Tan, Medical Student
Elliot Schiff, Medical Student
Marc-Mina Tawfik, Medical Student
Meaghan O'Neill, Physician Assistant
Christina Fang, MD
Nadeem Akbar, MD
Patrick Colley, MD
Albert Einstein College of Medicine

Introduction:
Rhinitis medicamentosa (RM) is characterized by a rapid increase in tolerance to the effects of nasal decongestants resulting in worsening nasal congestion beyond the recommended short course of less than five consecutive days. The goal of this study is to characterize the perspective of an underserved, inner city patient population regarding the initial starting of nasal decongestants on a long-term basis and the subjective effectiveness of standard treatments as well as the presenting symptoms of patients found to have RM.

Methods:
Patients with a previous diagnosis of RM from 2014 to 2021 and patients presenting to the Otolaryngology clinic starting from 2022 to the present participated in a twelve-question survey regarding their diagnosis of RM.

Results:
A total of 33 patients have completed the survey. Patient demographics were collected along with survey responses regarding history of nasal decongestant use and relief of symptoms after stopping decongestants. Most patients also had a diagnosis of an atopic condition (69.7%). The most common presenting symptoms include nasal congestion (100%), hyposmia (54.55%), worsening of allergies (27.27%), and facial pressure (27.27%). The respondents indicated that most were unaware of the risk of RM (72.73%), used nasal decongestants about 1-3 times per day (60.61%), had symptomatic control for less than 4 hours (30.30%), and were most likely to continue nasal saline rinses for relief (50%).

Conclusion:
In underserved patient populations, emphasis must be placed on improving health education of nasal decongestant use during clinical visits to foster greater physician-patient communication and decrease incidence of RM.

Poster #C125
**Rhinologic complications of pregnancy**
Jacquelyn Callander, MD
Yasmin Eltawil, BS
Patricia Loftus, MD, FARS
University of California San Francisco

Introduction:
Rhinologic complications of pregnancy are common. Hormonal effects on the nasal mucosa are likely contributors. Despite its prevalence, the literature surrounding the topic remains sparse. The objective of this study is to characterize rhinologic complaints during pregnancy that prompt otolaryngologist referral and evaluation.

Methods:
A retrospective cohort study was performed, assessing all pregnant patients evaluated in the otolaryngology clinic of a tertiary care center from January 2013- January 2023. Subjects with a rhinologic concern were included in the analysis and electronic medical records were mined for data.

Results:
The study included sixty pregnant patients with rhinologic concerns. Chief complaints included epistaxis (41.7%), rhinitis of pregnancy (23.3%), and exacerbation of chronic rhinosinusitis (35%). Within the subgroup of patients with epistaxis, twenty (80%) were primigravida, and this risk factor was positively correlated with epistaxis on multivariate analysis controlling for advanced maternal age, gestational diabetes, pre-eclampsia, gestational and chronic hypertension ($p=0.043$). Though exacerbation of chronic rhinosinusitis was a common etiology for presentation, this was not associated with any of the aforementioned potential risk factors.

Conclusion:
Epistaxis was the primary reason for referral to an otolaryngologist, and primigravida status was identified as a novel risk factor for this complication. Many patients also presented in the setting of exacerbation of chronic rhinosinusitis. Improved understanding of the prevalence and risk factors for pregnancy-related rhinologic concerns will allow us to better counsel and ultimately treat this vulnerable patient population.

Poster #C126

**Rhinologic considerations for the professional aviator**

John Curnes, MD
Ashley Schemel, Dr.
Ethan McGann, Dr.
Gregory Capra, MD, FARS
Angel Perez, Dr.

Aviation is a complex and rapidly growing field composed of a broad demographic of civilian and military aviators. These men and women are held to strict medical standards to ensure the safe and effective piloting of aircraft. Common issues of the nasal passages and sinuses can compromise the aviator's ability to meet such criterion and conduct safe flight. In these instances, referral to an otolaryngologist is often necessary for evaluation and treatment. This report was developed to equip otolaryngologists providing rhinologic care for the professional aviator. Published Federal Aviation Administration (FAA) Aerospace Medical and US Military guidelines were queried for the most common rhinologic conditions of aeromedical significance. An in-depth literature review was then performed for each condition, with emphasis on up-to-date management with respect to aviators. These findings were then compared to current FAA and United States Military official standards and regulations. The comprehensive otolaryngologist must be equipped to care for the professional aviator by not only being aware of best practices for treatment of common rhinologic pathology affecting the aviator, but by also understanding the application of care with respect to aeromedical standards. Therefore our findings are detailed and itemized to provide readily available practical guidance for clinical application.

Poster #C127

**Risk factors for suicidal ideation in patients with skull base tumors: A large cohort analysis**

Tony Chung, MS
Vikram Vasan, Mr.
Shaun Edalati
Alfred Marc Iloreta, MD
Satish Govindaraj, MD, FARS
Icahn School of Medicine at Mount Sinai

Introduction:
Patients with head and neck cancer face a suicide rate three times that of the general population due to the distress of diagnosis and complications. The association between mental health and skull-base tumors (SBT), specifically, is less explored. This study aims to determine sociodemographic and mental health risk factors for suicidal ideation (SI) in patients with SBT.

Methods:
A retrospective cohort study was conducted on 371,405 patients with SBT from the National Inpatient Sample (2016-2019). Survey-weighted methods assessed both univariate and multivariate risk factors for SI.

Results:
A total of 2,600 (0.7%) patients had SI. After adjusting for confounders, an older age was linked to decreased SI risk (AOR=0.97; P<0.001). Treatment in a Western hospital and private insurance were protective factors (AOR=0.492, 0.524, respectively; P<0.001 each) of SI. Neither ZIP code income nor tumor subtype had a statistically significant relationship with SI. Alcohol dependence, anxiety, and adjustment disorders were significant risk factors (AOR=3.59, 1.52, 5.49, respectively; P <0.001,=0.001,<0.001 respectively). There was no association with nicotine dependence, opioid use, or chronic pain. Depressive and bipolar disorders emerged as the most prominent mental health comorbidity predictors (AOR=7.12, 8.55, respectively; P<0.001 each). In our univariate analysis, meningiomas corresponded with lower SI rates, while pituitary adenomas were associated with higher rates of SI.

Conclusion:
Younger age and mental health comorbidities significantly influence SI risk in SBT patients, while private insurance serves as a protective factor. Mental health screening may be important to clear SI in SBT patients.

Poster #C128

**Schwannoma presenting as skull base mass involving bilateral olfactory clefts and cribriform plate**

Jamie Lewis, M3
Jason Lee, Dr.
Keonho Kong, MD

We present a case of a 64-year-old female with an incidentally found skull base mass after a syncopal event on Computed Tomography scan. Her associated symptoms included alternating nasal congestion, bilateral eye irritation, and hyposmia. CT scan revealed a midline hypodense lesion which occupied bilateral olfactory clefts and was associated with thinning of the cribriform plate and crista galli erosion. Nasal endoscopy did not reveal evidence of mass or polyps. Physical exam was unremarkable. Endoscopic resection was performed with successful removal of the mass. The mass was noted to be in the right olfactory cleft displacing the septum medially and abutting the cribriform without bony erosion of skull base. Intraoperative frozen section showed spindle cell neoplasm. Final pathology revealed a peripheral nerve sheath tumor consistent with schwannoma. The patient had no postoperative complications and showed significant improvement in the following months. Her hyposmia improved postoperatively, as well. There is significant uncertainty as to how a schwannoma can form on a nerve devoid of a myelin sheath. Some studies suggest a tumor origin of aberrant schwann cells along the nerve, or transformation of mesenchymal cells into tumor cells. In our patient's case and many others, these tumors have been found incidentally. Literature indicates that schwannomas account for only 8% of intracranial tumors, with an incidence of 10.4 per million per year. Of the 8%, only 70 cases have been reported indicating involvement of nerves that lack schwann cells such as the olfactory and optic nerves (2022). This case highlights an additional occurrence of an olfactory schwannoma with pathology initially concerning for spindle cell neoplasm.

Poster #C129

**Sex differences in pre-op and post-op disease severity in chronic rhinosinusitis**

Julian Purrinos, BS
Julisa Nuñez, Medical Student
Renata Grozovsky, Clinical Research Scientist
Roy Casiano, MD, FARS
Corinna G. Levine, MD, FARS
University of Miami Miller School of Medicine

Objective:
This study assesses differences in chronic rhinosinusitis (CRS) severity among male and female patients undergoing endoscopic sinus surgery (ESS) using the Lund-Kennedy Endoscopy score (LKE) and Lund-MacKay CT score (LMS).

Study Design:
Retrospective Cohort Study

Methods:
IRB approved study including adult CRS patients undergoing ESS at an academic program from 8/2021-9/2023. Data on sociodemographics, comorbidities, CRS was collected pre-op and 3-months post-op. We excluded patients with incomplete data. We performed descriptive statistics, calculated mean LKE percent change (%change) post-op, and the student's t-test compared means. A priori a clinically significant difference in %change between cohorts was set at 10%.

Results:
In our population 150 men and 123 women met criteria. Mean age was 53±16 years and demographics: 80% White, 15% Black, 47% Hispanic. Comorbidity scores were similar between sexes. Pre-op LMS was similar among cohorts (M=10±11, F=11±7). LKE scores were comparable between men (pre-op=4.5;post-op=1.9) and women (pre-op=4.4;post-op=2.1). Women had a greater LKE %change post-op (M=18%, F=28%), meeting threshold for clinically significant difference. In the polyp subgroups, CRSwNP (44%) had a higher %change (M=67%, F=58%) versus CRSsNP (M=14%, F=0.3%). Male CRSsNP had a clinically significant greater LKE %change. Similarly, males with revision surgery had a higher LKE %change (M=38%, F=20%). Primary surgeries had similar %change (M=34%, F=34%).

Conclusion:
Sex cohorts both had similar pre-op LMS and showed improvement in LKE scores after ESS. Female patients had a larger %change in LKE score. However, polyps and revision surgery differentially impacted the %change in LKE between sexes.

Poster #C130

**Sex differences pre-op and post-op SNOT-22 CRS**

Julisa Nuñez, MS
Julian Purrinos, Medical Student
Renata Grozovsky, Clinical Research Scientist
Roy Casiano, MD, FARS
Corinna G. Levine, MD, FARS

Objective:
Evaluate pre-op and post-op Sino-nasal Outcome Test (SNOT-22) scores between men and women undergoing endoscopic sinus surgery (ESS) for chronic rhinosinusitis (CRS).

Study Design:
Retrospective Cohort Study

Methods:
We included adult CRS patients undergoing ESS at an academic institution from 8/2021-9/2023. This IRB approved study collected data on sociodemographics, covariates, CRS, and patient-reported outcomes pre-op and 3-month post-op. We excluded patients without complete data or with another primary diagnosis. We performed descriptive statistics, calculated mean percent change (%change) in post-op SNOT-22 scores, compared means with student's t-test. A priori a clinically significant difference in mean %change was set at 10%.

Results:
Criteria was met by 273 patients, 55% men (n=150) and 45% women(n=123), with mean age 53 years and demographic distribution: 80% White, 15% Black, 47% Hispanic, with 28% preferring Spanish language. Age, revision surgery, polyps, comorbidity, and literacy was similar between sex cohorts. Women and men had similar SNOT-22 scores pre-op(M=38, F=42; p=0.09), post-op(M=25, F=26, p=0.62), and %change at 3months(M=30%, F=29%, p=0.82). CRS with nasal polyps was present in 44% (n=121). Polyp patients showed no differences in SNOT-22 %change between sexes(M=42%, W=42%). However, polyp patients had a greater %change than non-polyp patients(W=16%, M=25%). Revision and primary surgery subgroups had similar %change: (revision:M=33%, W=28%; primary:M=33%, W=28%).

Conclusion:
Both sexes had similar pre-op SNOT-22 scores and showed significant SNOT-22 improvement 3-months after ESS. Polyps trended toward differentially impacting SNOT-22 %change between the sexes and require further study.

Poster #C131

**Sinonasal morbidity in transpterygoid versus transsphenoidal approaches to the skull base**

Jasmeet Saroya
Alice Huang, Resident
Farideh Hosseinzadeh
Christine Lee, Dr.
Juan Fernandez-Miranda, Dr.
Peter Hwang, MD, FARS
Zara Patel, MD, FARS
Jayakar Nayak, MD, PHD
Michael T. Chang, MD

Objective:
It is critical to assess the sinonasal impact of increasingly invasive approaches to the skull base. We studied sinonasal morbidity of a transpterygoid (TP) approach when performed with transsphenoidal (TS) surgery.

Methods:
SNOT22 total and subdomain scores were assessed for patients undergoing TS versus combined TP and TS approaches (TPwTS). TS and TPwTS cohorts were matched by age, sex, pathology, and tumor location using propensity matching. SNOT22 scores were compared at 2, 6, and 12 weeks postop via t-test. Multivariate regression models were used to identify associations between changes in SNOT22 and surgical factors including septoplasty, middle turbinate (MT) resection, sphenopalatine artery sacrifice, vidian nerve sacrifice, V2 sacrifice, CSF leak, nasoseptal flap.

Results:
70 patients were studied: 35 TS vs 35 TPwTS. There was no difference in baseline SNOT22 (TS 20.4 ± 18.2, TPwTS 18.0±21.7, p=0.617). Both cohorts had a significant increase in SNOT22 scores at 2 weeks (TS 27.9±20.8, p=0.02; TPwTS 30.8±25.2, p<0.01), but a return to baseline at 6 weeks (TS 18.8±14.3, p=0.59; TPwTS 14.3±20.9, p=0.38) and 12 weeks (TS 21.9±26.3, p=0.98; TPwTS 24.4±30.7, p=0.22). TS and TPwTS cohorts did not significantly differ in SNOT22 total postoperatively (2 wks p=0.612, 6 wks p=0.414, 12 wks p=0.854) nor for any SNOT22 subdomain scores at all timepoints (p>0.05 for all). MT resection was associated with worse SNOT22 (β=0.313, p=0.035) and rhinologic subdomain (β=0.404, p=0.008) scores. Other variables were not significantly associated with SNOT22 change.

Conclusion:
TP approach does not increase sinonasal morbidity when performed with TS approach. MT resection may adversely impact short-term sinonasal outcomes.

Poster #C132
**Sinonasal NUT carcinoma: A systematic review and case report**
David Ahmadian, BS
Phil Tseng
Fiona Anushi Liyanage
Shireen Samargandy, MD
Christopher Le, MD, FARS
University of Arizona, College of Medicine – Tucson

Introduction:
NUT carcinoma (NC) is a rare and aggressive malignancy often occurring in the midline structures of the head and neck. In this study, we present a systematic review and a novel case report of a patient presenting with a NC of the maxillary sinus

Methods:
Online database search generated 1514 articles, of which 27 were included in the final analysis. Additionally, clinical outcomes were described for a patient presenting with sinonasal NC at a tertiary academic medical center

Results:
Within the 27 articles, there were 39 patients (20F, 19M). Common presenting symptoms were nasal obstruction (55.2%), epistaxis (48.3%), and ocular symptoms (48.3%). Common primary sites of malignancy were the nasal cavity (51.3%), ethmoid sinus (25.6%), and maxillary sinus (17.2%). 86.2% received radiation therapy, 79.3% received immunotherapy, and 79.3% underwent surgery. Mean length of follow-up was 9.81 months. The overall cohort mortality rate was 50% with a mean length of survival of 6.48 months. A 47-year-old female presented with left maxillary pain, congestion, and V2 hypoesthesia. Preoperative MRI showed a 5.9x5.0x5.8 cm lobulated, exophytic mass in the left maxillary sinus extending into the premalar and retromaxillary soft tissues. The patient underwent combined
endoscopic/open resection with total maxillectomy, orbital exenteration, WLE of cheek soft tissue, pterygopalatine and infratemporal fossa dissection, neck dissection, and free flap reconstruction. Pathological findings demonstrated NUT midline carcinoma, pT4aN2a. The patient is still alive 41.2 months after presentation.

Conclusion:
Sinonasal NC remains an understudied clinical entity. Further, large-scale studies are needed to improve clinical outcomes.

Poster #C133
**Sinonasal quality of life in primary ciliary dyskinesia**
Theresa Dickerson, MS
Taylor J. Stack, BS
Aurelia S. Monk, BS
Brian J. Thorp, MD, FARS
Cristine Klatt-Cromwell, MD
Charles S. Ebert Jr., MD, MPH, FARS
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
University of North Carolina School of Medicine

Background:
Primary Ciliary Dyskinesia (PCD) is a rare disorder resulting in nearly universal chronic rhinosinusitis (CRS). Sinonasal quality of life (QoL) data is limited in this population as PCD is a rare condition. We hypothesized that our PCD cohort would have worse sinonasal QoL compared to previously studied Cystic Fibrosis (CF) cohorts.

Methods:
A prospective study including those with genetically confirmed PCD. Subjects completed the Sino-nasal Outcome Test (SNOT-22). Statistical analyses were performed.

Results:
A total of 32 patients with PCD were enrolled, aged 10-75 years. On electron microscopy, the majority of the cohort had outer dynein arm defects (47%, n=15/32), or inner dynein arm defects or microtubular disorganization (31%, n=10/32). The overall median SNOT-22 score was 35, IQR=22,47. SNOT-22 scores were significantly higher in females (43, IQR=23,57) compared to males (22, IQR=20,31), (p=0.008). Additionally, individuals less than 21 years of age had higher SNOT scores (37, IQR=25,48) than those older than 21 years of age in the PCD cohort (33, IQR=21,46), (p=0.9).

Discussion:
Our results demonstrate poor sinonasal QoL in PCD patients. This PCD cohort has worse QoL compared to previous CF cohorts; Uyttebroek et al. demonstrated a median SNOT-22 score of 16 in CF patients. Our findings support our previous work with a retrospective report of Rhinosinusitis Disability Index Scores in PCD patients compared to CF patients. Continuing to study PCD compared to other mucociliary disorders presents an opportunity to increase awareness of morbidities specific to PCD and aid in clinical decision-making.

Poster #C134
**Sinus surgery in radiation-Associated chronic rhinosinusitis**
Kevin Herrera, BS
Sheng Zhou, MD
William Zheng
Kevin Hur, MD
Keck School of Medicine of USC

Background:
Radiation therapy is known to disrupt mucocilliary physiology and has been associated with higher rates of chronic rhinosinusitis. We investigated the risk of endoscopic sinus surgery (ESS) in patients who developed chronic rhinosinusitis without nasal polyposis (CRSsNP) after radiation treatment for nasopharyngeal (NPC) and nasal cavity malignancies.

Methods:
Using the TriNetX US collaborative database, patients 18 years or older with a new CRSsNP diagnosis were retrospectively followed for 5 years. The cohort was stratified into patients with and without a prior history of radiation treated NPC or nasal cavity malignancy. Patients with surgically treated sinonasal malignancies, metastatic disease, or nasal polyps were excluded. Groups were propensity-matched by age, sex, race, ethnicity, and history of asthma. Primary outcomes included first-time ESS and antibiotic prescription frequency. Measures of association, Kaplan-Meier estimates, and cohort statistics were calculated.

Results:
Of the 504 patients included, a majority were male (71.6%) with an average age of 57.0 years. The radiation group consisted of 166 patients with NPC and 86 with a nasal cavity malignancy. ESS risk was 11.3% in the radiation group and 4.3% in the control group during the 5 year follow-up. The radiation group was more likely to undergo ESS [OR: 2.81; 95%CI:(1.37-5.78)] compared to the control group. On separate analysis, the radiation group had a higher mean number of antibiotic prescriptions compared to the control (2.76 vs. 1.65; $p<0.01$).

Conclusion:
Patients who develop CRSsNP after radiation treatment for NPC or a nasal cavity malignancy are more likely to undergo ESS and have higher antibiotic usage.

Poster #C135
**Skull base pressures with swallowing**
Glen Souza, MD
Emily Garvey, Medical Student
Bita Naimi, BA
Paavali Hannikainen
Peter Benedict, MD
Elina Toskala, MD, FARS
Gurston Nyquist, MD, FARS
Marc Rosen, MD, FARS
James Evans, MD
Mindy Rabinowitz, MD, FARS
Thomas Jefferson University Hospital

Endoscopic sinus surgery (ESS) exposes the skull base to various forces while swallowing and while on positive airway pressure (PAP). However, these forces have been under-reported and unquantified. In a first, our study fills this knowledge gap by presenting normative data on pressures that the post-ESS skull base is exposed to in day-to-day life.

Methods:
This IRB-approved prospective clinical trial included patients with obstructive sleep apnea who underwent ESS for chronic rhinosinusitis (CRS). Microsensors were placed in the sphenoid sinus and the mid-nasal cavity at the end of surgery. Once the patients were awake postoperatively, they were asked to sip water through a straw, eat apple sauce with a spoon, and gently blow their noses while the pressures generated were recorded.

Results:
Seven patients were included in the study. The mean age was 49.8 years, and the mean BMI was 39.2 kg/m2. The mean pressures recorded at the sphenoid sinus and mid-nasal cavity in cm of H2O while sipping water through a straw and eating apple sauce with a spoon were -2.22 and -3.22 and -2.50 and -3.73, respectively. Gently blowing the nose generated pressures of -1.22 and -1.60 cm of water at the sphenoid sinus and mid-nasal cavity, respectively.

Conclusion:
For the first time in literature, this study identifies and quantifies forces that the post-ESS skull base is exposed to. While these forces did not adversely affect patient outcomes in our study and are lower than pressures previously shown to affect skull base reconstruction adversely, this normative data could help in a better understanding of forces at play along the skull base and their effects on the post-ESS sinonasal cavity.

Poster #C136

**Smoke signals: Internet searches uncover wildfire impacts on sinonasal health**

Stella Lee, MD
Sophie Yu, Student
Mengyuan Ruan
Margaret Mitchell
Simon Chiang, Research Assistant
Tanujit Dey
Regan Bergmark, MD, FARS
Alice Maxfield, MD, FARS
Rachel Roditi, MD, FARS
Xiaodan Zhou
Youn Soo Jung
Brigham and Women's Hospital

Introduction:
Climate change has led to an increase in wildfire season length, frequency, and burned area. In regions affected most by wildfires, ambient air pollution has been implicated in the development and severity of sinonasal disease. This study utilizes internet search activity to investigate the association between regional wildfire air pollution exposure and sinonasal disease.

Methods:
Search activity data at the weekly level for sinonasal and respiratory health terms recorded in Google Trends (google.com/trends), smoke, and overall particulate matter 2.5 (PM2.5) data from the state of California between 2015-2020 constituted the analytical sample. Pearson correlation analysis (0 to 4 weeks lag) was used to determine the association between smoke specific PM2.5, overall PM2.5, and sinonasal search terms.

Results:
Documented wildfire events across California correlated with increased smoke PM2.5 and overall PM2.5. Higher overall PM2.5 was statistically significantly associated with increased searches for "runny nose" at lag of 0, 2, 3, and 4 weeks, "mucus" at lags of 2, 3, and 4, "congestion" at lag 3 and 4, "sneezing" at lags of 0, 1, 3, and 4, "asthma" at lags of 0, 1, and 4 weeks and "inhaler" at lag of 0, 1, 3, and 4. Smoke PM2.5 was positively correlated with searches for "asthma" and "inhaler" at lag of 0 in the San Francisco-Oakland-San Jose territory.

Conclusions:
Sinonasal disease related search activity correlates with short and long term exposure to PM2.5. These data demonstrate the utility of Google Trends search data in assessing regional sinonasal disease burden and the increased prevalence of sinonasal symptoms after wildfire events.

Poster #C137

**Social determinant factors of skull-base squamous cell treatment in the US**

David Fei-Zhang, BA
Rishabh Sethia
Cyrus Abrahamson
Daniel Chelius
Jill D'Souza
Anthony Sheyn
Jeffrey Rastatter, Physician

Introduction:
Social determinant of health (SDH) studies on skull-base squamous cell carcinomas (SBSC) have been limited by sample size and range of SDH-factors considered. Using a recent national cohort of SBSC patients, we aimed to analyze the interactional impact of a multitude of individual- and community-level SDH on SBSC treatment outcomes

Methods:
This retrospective cohort study of 6700 SBSC patients from the SEER database between 2010-2018 utilized age-adjusted, multivariate logistic regressions. Models included 12 SDH-covariates of individual sex & race/ethnicity (non-Hispanic white as reference level), alongside census-level rurality-urbanicity and Yost-Socioeconomic Status (SES) Index (composite metric of 7 census-level measures of income, education, employment) to assess first-line & non-first-line treatment receipt (surgery and external-beam radiation, chemo) and 3mth+ delay-in-treatment after diagnosis.

Results:
For surgery, female sex (OR, 0.85; 95% CI, 0.75-0.96), poor Yost-SES (0.88, 0.78-0.98), and minority race/ethnicity (0.48, 0.43-0.54) were markedly negative independent predictors (all $p<0.023$). For radiation receipt, female sex (1.14, 1.01-1.28) and minority race/ethnicity (1.65, 1.47-1.84) were markedly positive independent predictors (all $p<0.041$). For chemotherapy, minority race/ethnicity (1.60, 1.43-1.79, $p<0.001$) was a markedly positive independent predictor. For treatment delay occurrence, minority race/ethnicity (1.32, 1.13-1.54) and poor Yost-SES (1.31, 1.13-1.52) were markedly positive independent predictors (all $p<0.001$).

Conclusion:
Multifaceted SDH analyses display quantifiable associations of social factors to SBSC treatment disparities, providing actionable targets for prospective initiatives.

Poster #C138
**Spindle cell lipoma of the nasal mucosa**
Josef Shargorodsky, MD, MPH
Konstandina Kokinakos, DO
Cameron DiGiorgio
Coastal Ear, Nose and Throat

A spindle cell lipoma is a benign, lipomatous neoplasm that typically arises within the subcutaneous tissue on the posterior neck or shoulder of older men. We report a case of a highly unusual presentation of a spindle cell lipoma in a female initially presenting with chronic nasal congestion non-responsive to pharmacological therapy. Computed tomography of the sinuses revealed bilateral pansinus mild to moderate mucosal thickening, right septal deviation and a large polypoid mass arising from the left posterior nasal cavity and filling the nasopharynx and much of the bilateral posterior nasal cavity. Final pathology of the excised mass obtained during endoscopic sinus surgery demonstrated a spindle cell lipoma. To date, there is generally limited literature documenting spindle cell lipomas involving the nasal or nasopharyngeal mucosa, and this is the first reported case of such a tumor arising from the posterior nasal floor.

Poster #C139
**WITHDRAWN**

Poster #C140
**Sublingual immunotherapy – Get it on Facebook!**
Aurelia S. Monk, BA
Shreyas Pyati
Meghan Norris, PA-C
Cristine Klatt-Cromwell, MD
Brian J. Thorp, MD, FARS
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
Charles S. Ebert Jr., MD, MPH, FARS
University of North Carolina - Chapel Hill

Background:
Immunotherapy is an efficacious treatment for environmental allergies. However, limited access to allergy clinics and potentially high costs may hinder patient access to immunotherapy. In response, there has been an emergence of direct-to-consumer immunotherapy companies advertising through social media.

Methods:
A web-based/social media search was performed to identify direct-to-consumer immunotherapy companies.

Results:
Three companies were identified: Wyndly, Nectar, and Curex. Each offers at-home fingerprick in vitro allergy tests for “common allergens” like pollens, mold, and pet dander. Patients consult a physician via telemedicine and receive custom sublingual immunotherapy (SLIT). Nectar and Wyndly charge $199 and $249 respectively for their initial allergy tests. Nectar’s SLIT costs $99/month, while Wyndly charges $99-$110 based on billing frequency. Neither accept insurance but do accept FSA and HSA payments. Curex presents two options: an insurance-billed plan with telemedicine visits and a self-pay plan without visits. Curex requires a $49 onboarding fee for both plans. Self-pay entails a $199 allergy test and $99/month for SLIT with discounts for extended commitments. When billed through insurance, allergy test coverage varies, but SLIT costs $49/month. Customers are responsible for telemedicine co-pays, capped at $500 annually. FSA and HSA payments are accepted.

Conclusions:
Three companies offer alternatives to in-office treatments, though testing accuracy, SLIT efficacy, and cost-effectiveness remain undetermined.

Poster #C141
**Surgical & medical management of chronic cocaine use-related rhinology complications: Scoping review**
Jacqueline Slobin, BA
Shaun Edalati, BS
Barak Spector
Vikram Vasan, Mr.
Katherine Liu
Joshua Rosenberg
Satish Govindaraj, MD, FARS
Mingyang Gray
Alfred Marc Iloreta, MD

Background:
Chronic cocaine use can give rise to severe rhinology complications such as septal perforations, sinusitis, and nasal necrosis. The manuscript reviews the rising concern of chronic cocaine use and its relationship with rhinology complications frequently necessitating surgical and medical intervention. This review serves to synthesize the existing body of literature regarding surgical and medical methodologies employed in addressing rhinology complications stemming from chronic cocaine use.

Methods:
The search strategy explored several medical databases, including PubMed, Scopus, and Embase, employing specific keywords like “”chronic cocaine use,”” “”rhinology complications,”” “”surgical management,”” “medical management, “”septal perforation,”” “”sinusitis,”” and “”nasal necrosis.”” The selection criteria include studies on surgical approaches and medical management for managing chronic cocaine use-related rhinology complications.

Results:
The review highlights its findings, revealing 1,460 results, with 49 studies meeting the criteria for investigating surgical and or medical management of rhinology complications related to chronic cocaine use. The various complications associated with chronic cocaine use are highlighted, ranging from palatal perforations and nasal defects to chronic rhinitis and sinusitis. Surgical and medical interventions play a pivotal role in addressing these complications.

Conclusions:
The manuscript emphasizes the significance of surgical and medical intervention in effectively managing chronic cocaine use-related rhinology complications, including nasal septum perforation, lateral nasal wall damage, epistaxis, and infection. It underlines the need for further treatment and research protocols.

Poster #C142

**Surgical management of headache and facial pain in chronic rhinosinusitis**

Luke Heiland, BS
Alejandro Marrero-Gonzalez
Shaun Nguyen, Physician
Hannah Farmer
Vinay Rathi, MD
Zachary Soler, MD, FARS
Rodney Schlosser, MD, FARS
Medical University of South Carolina

Background:
Headache and facial pain are common symptoms of chronic rhinosinusitis (CRS). However, the impact of surgical therapy on this subset of symptoms is not well characterized.

Methods:
A systematic review was performed by searching CINAHL, PubMed, and Scopus from inception through June 6, 2023. English-language articles reporting outcomes for facial pain/pressure or headache following endoscopic sinus surgery were selected for inclusion. Primary outcome measures included the visual analogue scale (VAS) and the sino-nasal outcome test (SNOT-22). Meta-analyses were performed using random and fixed effect models on continuous measures (mean), mean difference (Δ), and proportions (%).

Results:
The literature search resulted in 2,200 unique articles, of which 1,211 studies were excluded based on title/abstract screening. After a full-text review of 989 articles, 27 studies reporting on 2,832 patients were selected for inclusion. The mean patient age was 42.7±5.3 (range 16.0 – 84.0), with an average symptom duration of 5.3±2.8 years. Among these patients, 56.5% [95% CI: 52.4 to 60.6] were male and 74.0% [95% CI: 53.4 to 90.2] had nasal polyposis (NP). Patients with and without NP reported substantial reductions in both SNOT-22 facial pain/pressure (with NP: -1.8 [-3.0 to -0.6; relative reduction 72.4%]; without NP: -2.2 [-3.3 to -1.1; relative reduction 65.5%]) and VAS headache (with NP: -2.5 [-2.8 to -2.1; relative reduction 67.2%]; without NP: -2.8 [-4.7 to -1.0; relative reduction 42.7%]).

Conclusions:
Our findings suggest surgical therapy substantially reduces facial pain/pressure and headache in patients with CRS both with and without nasal polyposis.

Poster #C143

**Synthetic material in endoscopic anterior skull base repair**

Eric Liang, Medical Student
Arushi Wadhwa, Medical Student
Mohd Afiq
Mohd Slim, MBBcH
Yousif Alammar, MD
Sarah Khalife, MD
Doron Sommer, MD

Background:
Postoperative cerebrospinal fluid (CSF) leak continues to be a major source of morbidity following skull base surgery. Synthetic materials for endoscopic skull base repair have become increasingly popular due to greater customizability, availability, and avoidance of donor-site morbidity. We sought to review the literature regarding the utilization of different synthetic materials for endoscopic anterior skull base repair and associated postoperative CSF leaks, meningitis, and revision requirements.

Methods:
A systematic review and meta-analysis were conducted following PRISMA guidelines. Risk of bias was analysed with the JBI appraisal tool. Proportionate meta-analysis with meta-regression was performed.

Results:
The search yielded 3 low, 22 moderate and 12 high risk studies: case series (n=27) and cohort studies (n=10). A total of 2376 patients were included for analysis. Overall postoperative CSF leak rate was 5% ($p<0.01$), with 8% for synthetic material only, 3% for synthetic with autologous tissue and 4% with nasoseptal flap (p:0.48). Overall postoperative meningitis was 0% ($p<0.01$), with subgroups being 0% vs 0% vs 1% (p:0.81) respectively. Overall revision rate was 0% ($p<0.01$), with subgroups being 1% vs 0% vs 1% (p:0.43).

Conclusion:
Based on level 3 and level 4 evidence, the use of synthetic material alone yielded a higher postoperative CSF leak rate as compared to when used in combination with autologous tissue or nasoseptal flap. Rates of postoperative meningitis and revision requirements were low, and no significant differences were observed between subgroups. Additional high level evidence data and more consistent reporting will be required to make more definitive recommendations.

Poster #C144

**Telemedicine carbon emission & travel cost reductions**

Hunter Kellerman, BS
Jess Mace, MPH CCRP
Mathew Geltzeiler, MD, FARS
Timothy Smith, MD, MPH, FARS
Kara Detwiller, MD, FARS
Vivek Pandrangi, MD
Oregon Health & Science University

Background:
Healthcare-associated carbon dioxide (CO2) emissions are rising, and identifying means to mitigate these may provide direct benefits to population health especially among patients with chronic sinonasal disease. This study aimed to assess potential personal travel costs and CO2 emissions saved due to telemedicine visits.

Methods:
Retrospective review of patients within Oregon presenting for telemedicine visits at a tertiary rhinology center from July to December 2022. Distance from patient's address to clinic (miles), as well as estimated average travel time (minutes), travel costs (USD), and CO2 emissions (kg) were calculated per round trip prevented by providing care at a distance. Area deprivation indices (ADI) were based on 9-digit zip codes.

Results:
Among 212 included visits, the mean ± standard deviation (SD) age was 58.9 [±16.1] years. Chronic rhinosinusitis was the most common diagnosis (54.4%) followed by sinonasal neoplasms (15.3%). Most visits were follow-up (63.3%) or preoperative (26.1%). Telemedicine saved 38,487.2 miles and 38,700.7 minutes (633.3 hours) of roundtrip travel, reducing CO2 emissions by 15,789.5 kg (equivalent to approximately 3.5 gasoline-powered vehicles driven for one year or 2 homes' energy use for one year). Patients in the highest ADI quartile had significantly higher potential travel costs saved compared to other quartiles (median [interquartile range]; quartile 1: $11.2 [38.0]; quartile 2: $129.8 [282.7]; quartile 3: $151.6 [317.2]; quartile 4: $365.8 [284.5]; $p<0.001$).

Conclusions:
Telemedicine may facilitate reduction in the carbon footprint associated with healthcare as well as reduce indirect healthcare costs associated with travel.

Poster #C145

**Temporal, geographic, and socioeconomic factors affect incidence and outcomes in AIFS**

Kristine Smith, MD
Keenya Frazier
Richard Orlandi, MD, FARS
Abigail Pulsipher, Assistant Professor
University of Utah

Background:
The relationship between temporal and geographical variations and the incidence of acute invasive fungal sinusitis (AIFS) remains unclear. Furthermore, the impact of social determinants of health on AIFS outcomes is poorly understood. The objective of this systematic review was to summarize the literature on these topics using the Preferred Reporting Items for Systematic and Meta-Analyses guidelines.

Methods:
Standard databases were systematically searched in August of 2023 for articles that included the following variables related to AIFS: (1) temporal/geographic variations and (2) patient factors.

Results:
Sixteen studies were identified for inclusion. Associations between AIFS and COVID-19 were observed in certain geographic regions, particularly during the onset of the pandemic when high dose oral corticosteroids were frequently used. No studies specifically examined the impact of geographic location on the incidence or outcomes in AIFS. Two studies reviewed the relationship between AIFS incidence and season, producing varied results. While both demonstrated seasonal variation in the incidence of AIFS, the findings appeared to be dependent on local climate conditions. Female sex and Black and Hispanic race appeared to be significant prognostic indicators for worse AIFS outcomes. A predominant number of studies included (80%) did not reported the social determinants of health.

Conclusion:
The findings of this systematic review reveal a data gap concerning the impact of geographic, temporal, and social determinants on AIFS. Further research is needed to determine the significance of these factors in AIFS.

Poster #C146

**Tezepelumab improves nasal blockage and smell in patients with nasal polyps and severe asthma**

Joseph K. Han, MD, FARS
Stella Lee, MD
Joshua Jacobs, Dr.
Flavia Hoyte, Professor
Anju Peters, Professor
Scott Caveney, Dr.
Nicole Martin, Ms.
Bhavini Parikh, Dr.
Christopher Ambrose, Dr.
Eastern Virginia Medical School

Rationale:
Chronic rhinosinusitis (CRS) with nasal polyps (NP) is a common comorbidity of severe asthma. Tezepelumab is approved for severe asthma treatment and has previously demonstrated improvement in the total SNOT-22 score vs placebo. This post hoc analysis evaluated the correlation between changes in nasal blockage and sense of smell/taste in patients with a history of NP from the phase 3 NAVIGATOR study (NCT03347279).

Methods:
Patients (12–80 years old) with severe, uncontrolled asthma were randomized 1:1 to receive tezepelumab 210 mg or placebo subcutaneously every 4 weeks for 52 weeks. Sino-Nasal Outcome Test (SNOT)-22 individual item scores were assessed from baseline to week 52 in patients with a history of NP. The relationship between the change from baseline to week 52 in nasal blockage and decreased sense of smell/taste item scores from the SNOT-22 were assessed using Spearman's rank correlation coefficient.

Results:
Overall, 165 patients were analyzed (tezepelumab, n=90; placebo, n=75). Change from baseline in nasal blockage score was −1.17 (tezepelumab) vs −0.30 (placebo; least-squares (LS) mean difference, −0.88 [95% CI: −1.35, −0.41]), and in decreased sense of smell/taste score was −1.54 (tezepelumab) vs −0.59 (placebo; LS mean difference, −0.95 [95% CI: −1.51, −0.39]). Positive correlations were observed between changes in nasal blockage and changes in decreased sense of smell/taste (tezepelumab, r=0.496; placebo, r=0.417).

Conclusions:
Tezepelumab led to improvements in CRS-specific symptoms vs placebo in patients with severe, uncontrolled asthma and a history of NP. In both treatment groups, a moderate positive correlation was observed between changes in nasal blockage and decreased sense of smell/taste.

Poster #C147

**The association of anxiety with chronic rhinosinusitis in the United States - A population study**

Najm Khan, MBS
Meher Gajula
Aatin Dhanda, Clinical Research Fellow
Lexi Goehring, Medical Student
Masayoshi Takashima, MD, FARS
Renjie Hu, Professor
Jeffrey Vrabec, Professor
Omar Ahmed, MD, FARS
Houston Methodist Hospital, Houston, Texas

Background:
Despite rigorous management strategies, many patients with chronic rhinosinusitis (CRS) report diminished QoL. The significant financial burden experienced by CRS patients and an increased prevalence of anxiety may synergistically decrease patient QoL. This study aims to determine the association between anxiety and CRS in a diverse national sample.

Methods:
The National Institutes of Health All of Us database was queried from May 2017 to August 2023 for CRS patients, defined as having at least 2 diagnoses of chronic sinusitis. Patients were propensity score matched in a 1:3 fashion with non-CRS patients for age, race, sex, income, OSA, asthma, and dyssomnia. For CRS patients, anxiety was included if it occurred after developing CRS. Multivariable logistic regression was performed for statistical evaluation.

Results:
Propensity score matching resulted in 54,976 patients (mean age 60.79 (SD 15.11)) with 13,744 CRS patients and 41,232 controls. There was a baseline difference in anxiety prevalence between the controls and CRS (19.3% vs 21.2%, $p < 0.001$). After multivariate analysis, CRS patients were more likely than controls to have a diagnosis of anxiety (OR: 1.79, $p < 0.001$, [95%CI, 1.69-1.89]). In addition, Hispanic patients (OR: 1.14, $p < 0.001$, [95%CI, 1.07-1.22]) and those diagnosed with depression (OR: 5.21, $p < 0.001$, [95%CI, 4.96-5.48]) were also more likely to have anxiety. Education, health insurance, rural residence, obesity, and diabetes were not associated with increased odds of having anxiety.

Conclusion:
This propensity-matched study suggests that patients have a higher chance of developing anxiety after they are diagnosed with CRS when accounting for socioeconomic factors and comorbidities.

Poster #C148

**The effect of hyperbaric oxygen therapy on the sinonasal microbiome**

Galit Almosnino, MD
Ryan Little, MD
Rebecca Bell, Resident
Dartmouth Hitchcock Medical Center

Background:
The human microbiome plays an important role in both health and disease. Prior studies focusing on the gastrointestinal system have demonstrated significant beneficial alterations in the gut microbiome and inflammatory environment in response to hyperbaric oxygen therapy (HBOT). To date, there have been no studies evaluating the effect of HBOT on the nasal microbiome. This pilot study aims to characterize the nasal microbiome before and after HBOT in adult patients. Specifically, we aim to define the sinonasal microbiome communities and to characterize the sinonasal inflammatory environment in patients before and after completion of HBOT.

Methods:
In this observational, prospective study, study participants underwent middle meatus and olfactory cleft sampling under direct visualization prior to and after the completion of HBOT. Demographic data and a validated symptom based patient-reported measure of outcome, the Sino-nasal Outcome Test-22 (SNOT-22), was obtained for each patient.

Results:
We intend to present the sinonasal microbial diversity and cytokine profile for each patient before and after HBOT.

Conclusion:
Further investigation is needed to determine the impact of HBOT in various diseased states. The results of this pilot study may serve as a stepping stone toward understanding if HBOT can have a potential therapeutic effect on the sinonasal mucosa in conditions where inflammatory-specific pathways are thought to play a substantial role in pathogenesis – such as in chronic sinus disease or post-viral olfactory dysfunction.

Poster #C149

**The harmful effects of nutritional supplements and its role in intractable epistaxis**

Chase Kahn, MD
Glen Souza, MD
Alexander Duffy, MD
Shreya Mandloi
Samuel R. Shing
Peter Benedict, MD
Elina Toskala, MD, FARS
Gurston Nyquist, MD, FARS
Mindy Rabinowitz, MD, FARS
Christopher Valentini
Marc Rosen, MD, FARS
Thomas Jefferson University Hospital

Introduction:
The utilization of herbal remedies and dietary supplements has gained significant popularity in recent years, reflecting a growing interest in holistic and complementary approaches to medicine. These supplements, often unregulated by the FDA, have become routine in patient's daily regimen. Despite their prevalence, patients frequently fail to recognize the potential risks posed by these supplements and frequently do not disclose their use of supplements to healthcare providers. This study's goal was to explore the significance and role of herbal supplements in spontaneous, severe epistaxis.

Methods:
This is a single-institution case series and literature review that provides a comprehensive examination of the dangers linked to the use of dietary and herbal supplements in the context of severe spontaneous epistaxis.

Results:
Three cases were examined of healthy individuals who experienced profuse, spontaneous epistaxis in the past year and were found to be using a combination of herbal and nutritional supplements. From a standard literature review, we found only one article within Otolaryngology that has investigated the impact and risk of herbal supplements on coagulation.

Discussion:
This project has generated an easy-to-use, clinically applicable list of over 24 herbal remedies including high-risk ingredients such as vitamin E, ginkgo, and ginger known to contribute to epistaxis as well as a series of screening questions to help facilitate the disclosure of herbal and dietary supplements. Otolaryngologists must possess comprehensive knowledge of the risks and interactions of dietary supplements to safeguard their patients' well-being and mitigate the risk of potentially life-threatening epistaxis.

Poster #C150

**The potential perils of gas stoves and volatile organic compounds on sinonasal health**

Stella Lee, MD
Simon Chiang, Research Assistant
Youn Soo Jung
Tanujit Dey
Sophie Yu, Student
Tejas Athni
Rohith Kariveda
Mengyuan Ruan
Margaret Mitchell
Rachel Roditi, MD, FARS
Regan Bergmark, MD, FARS
Brigham and Women's Hospital

Introduction:
Volatile organic compounds (VOCs) are ubiquitous but poorly understood pollutants found in our daily life: from gas stoves to building materials. In this study we characterized VOC exposure patterns of the general population and analyzed the association of exposure to sinus health outcomes.

Methods:
We used data from NHANES 2013-2014 including laboratory data of urinary metabolites from 16 parent VOCs, questionnaires assessing sinonasal health, and demographics. Unsupervised machine learning was used to group urinary metabolites into exposure sources and to derive a composite exposure score from each group (n=1027). We evaluated the association between exposure scores and sinus health outcomes through logistic regression.

Results:
Unsupervised machine learning identified three groups: occupational sources, household sources, and combustion byproducts. Univariable analysis found that 1 unit increases in household and combustion exposure scores were significantly associated with an increase in the probability of respondents reporting more than two sinus infections by 22.8% (95% CI: 7.4-41.8, p=0.003) and 22.6% (CI: 4.2-44.3, p=0.014), respectively.

Conclusion:
Everyday household VOC exposure may pose a significant risk factor for sinonasal disease. To inform relevant intervention and policy, additional research is needed to evaluate the burden of VOC exposure from everyday household sources and to describe the mechanisms of VOC-mediated sinonasal inflammation.

Poster #C151

**The prevalence of allergic and non-allergic rhinitis before and after the 2020 Beirut blast**

Christophe Abi Zeid Daou, MD
Zeina Korban, MD
Ibana Carapiperis, Resident
Justin Ghadieh, Medical Student
Chadi Makary, MD, FARS
American University of Beirut

Background:
On August 4th, 2020, Beirut witnessed the largest non-nuclear explosion in modern history. The ammonium nitrate explosion caused a massive release of nitrate and nitrogen oxides into the atmosphere.

Aim/Objective:
Investigate the prevalence of allergic and non-allergic rhinitis in patients presenting for skin prick allergy testing pre and post Beirut blast.

Methods:
A retrospective chart review from January 2019 to March 2022. Patients presenting for skin prick allergy testing at one tertiary medical center were included. The sample was divided into two groups according to the date of testing.

Results:
Three hundred and four patients were included in this is a retrospective chart review, 138 were males and 166 females (54.6%). There were no statistical differences in smoking (P = 0.122), gender ratio (P = 0.086) and mean age (P=0.062) between the study groups. There was a significantly higher rate of negative sin prick tests post-Blast (p=0.016) with a higher rate of headaches and facial pressure (p=0.001). There was a higher rate of sneezing pre-Blast (p=0.005). There was no significant difference in the rates at which each allergen was positive between the two groups.

Conclusion:
Air pollution and contaminants, including ammonium nitrate and nitrogen oxides, are likely to exacerbate the pathogenesis of non-allergic rhinitis. By addressing these environmental factors, it is possible to alleviate the suffering of individuals with non-allergic rhinitis and improve their quality of life.

Poster #C152

**The protective effect of chronic rhinosinusitis in COVID-19 patients**

Andrew Li; Kevin Li, MD
Ahmed Soliman, MD

Background:
The effect of chronic rhinosinusitis (CRS) on COVID-19 has not been fully characterized. Patients with CRS have underlying inflammatory disease, characterized by type 2 inflammation. Some studies suggest a protective effect from CRS thought to be related to the downregulation of sinonasal ACE-2 receptors that the SARS-CoV-2 virus binds, whereas others found CRS to increase the risk for COVID-19 hospitalization. We sought to investigate the effect of CRS on COVID-19 infection rates and hospitalizations in our health system.

Methods:
After IRB approval was obtained, we retrospectively reviewed all patients with a diagnosis of CRS or COVID-19 between January 2020 and December 2022. Patient demographics, past medical history, COVID-19 infection, treatments, Lund-Mackay scores, and hospital course were recorded. Patients with CRS and COVID-19 were compared to a matched control group of patients without CRS.

Results:
152 patients with CRS and COVID-19 were identified. The incidence of COVID-19 infection in patients with CRS was 2.46% and 21.7% in patients without CRS. Patients in the CRS group had a shorter COVID-19t hospitalization length of stay (8 vs. 14 days, p = 0.033). All other variables assessing the severity of COVID-19 infection were not statistically different between groups. The prevalence of CRS in all patients with COVID-19 was 0.43%.

Conclusions:
Patients with CRS had a significantly lower incidence of COVID-19 infection as compared to matched controls without CRS. CRS patients with COVID-19 also had shorter hospitalizations. This study suggests that CRS may provide a protective effect against COVID-19 infection.

Poster #C153

**The relationship between overall symptom severity score and patient-reported chronic rhinosinusitis**

Ryan Cotter, BS
Katie Phillips, MD
Ahmad Sedaghat, MD
University of Cincinnati College of Medicine

Background:
Overall symptom severity (OSS) score and patients' self-assessment of their own CRS disease control (patient-reported CRS control) have recently been identified as consensus criteria essential for the assessment of CRS disease control. The objective of this study was to determine the psychometric relationship between OSS and patient-reported CRS control.

Methods:
Cross-sectional study of 123 prospectively recruited patients with CRS. All patients reported their OSS using a visual analog scale (range 0 – 10) and their disease-specific quality of life using the 22-item Sinonasal Outcome Test (SNOT-22). Patients were then asked to report their level of CRS disease control as "controlled", "partly controlled" or "uncontrolled".

Results:
For patients reporting "controlled" CRS, the mean OSS was 1.0 (SD: 0.8) and mean SNOT-22 was 18.7 (SD: 18.3). For patients reporting "partly controlled" CRS, the mean OSS was 4.5 (SD: 2.5) and mean SNOT-22 was 36.3 (SD: 16.9). For patients reporting "uncontrolled" CRS, the mean OSS was 7.0 (SD: 2.2) and mean SNOT-22 was 52.5 (SD: 19.9). Patient-reported control was associated with OSS (OR=2.03, 95CI: 1.66 – 2.50, p<0.001) and SNOT-22 (OR=1.07, 95%CI: 1.04 – 1.09, p<0.001). OSS was an effective predictor of patients who lost "control" of their CRS at a threshold value of >1.8 (sensitivity: 89.8%, specificity: 88.0%) and of patients reporting uncontrolled CRS at a threshold value of >4.6 (sensitivity: 92.1%, specificity: 63.5%). SNOT-22 was also a statistically significant predictor of patient-reported control but less so compared to OSS.

Conclusions:
OSS is very tightly associated with and predictive of how patients assess their own CRS control.

Poster #C154
**The role of artificial intelligence in rhinology**
Andrew Cunningham
Shreyas Pyati, Medical Student
Hayley Behm
Aurelia S. Monk, BS, Medical Student
Charles S. Ebert Jr., MD, FARS
Brian Thorp, MD, FARS
Cristine Klatt-Cromwell, MD
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
Brody School of Medicine at East Carolina University

Introduction:
ChatGPT, a state-of-the-art language model, has the potential to be an easily accessible educational resource for patients. However, there is concern about the accuracy and safety of its medical information. We aimed to assess the utility of ChatGPT in patient education as compared to physician responses regarding rhinology topics.

Methods:
ChatGPT was presented with questions related to common sinonasal complaints. Questions ranged from reasons for nasal congestion, treatment of chronic rhinosinusitis, and expectations or risks associated with sinus surgery. ChatGPT's responses were distributed to a panel of experienced rhinologists, who evaluated the quality of responses on a Likert scale as well as identified errors, missing information, and aberrant medical advice, if applicable. A systematic literature review of artificial intelligence applications in rhinology was also conducted and summarized.

Results:
ChatGPT's responses varied in quality. While the responses were generally accurate, there were several minor errors and occasionally suboptimal or incorrect advice. ChatGPT demonstrated potential in addressing straightforward questions but struggled with more nuanced and complicated questions.

Conclusion:
ChatGPT is a potentially valuable resource for educating patients and providing quick answers to common inquiries. However, its limitations become evident when addressing intricate, multifaceted issues or complex medical decision-making. The integration of artificial intelligence tools in rhinology has the potential to enhance patient care, but careful consideration of their limitations and the need for expert oversight is essential in their implementation.

Poster #C155
**The role of inhalant allergens on the clinical manifestations of atopic dermatitis**
Jaekeun Jung, MD, Student
Enos Clinton, MD
Kent Lam, MD, FARS
Joseph K. Han, MD, FARS
Eastern Virginia Medical School

Background:
Inhalant allergens provide a source of environmental factors that contribute to the development of clinical symptoms in patients with atopic dermatitis (AD).

Objective:
To review the relationship between inhalant allergens and AD.

Methods:
A literature review was conducted using three databases: PubMed/MEDLINE, ScienceDirect, and Web of Science. Search terms, including "atopic dermatitis," "atopic eczema," and "eczema," were used in combination with "inhalant allergen," "inhaled allergen," and "aeroallergen" to identify relevant published manuscripts that highlight the relationship between AD and exposures to inhalant allergens.

Results:
Fifteen articles were suitable for review. The studies included in the review investigated the effect of inhalant allergens on the clinical manifestations of AD through allergen sensitization, bronchial provocation, and direct skin contact.

Conclusion:
There is a significant relationship between exposures to inhalant allergens and AD. Sensitization of inhalant allergens, mainly house dust mites, follows a specific age-related pattern. Inhalant allergens may aggravate AD symptoms by either bronchial provocation or direct skin contact. Keywords: Atopic dermatitis, atopic eczema, eczema, inhalant allergen, inhaled allergen, aeroallergen, sensitization, IgE, house dust mite, grass pollen, birch pollen, HDM avoidance

Poster #C156

**The RVU compensation model in rhinologic surgical training**

Mackenzie O'Connor, MD
Joseph Lebowitz, MD
Joseph Connors, MD
Michele Santacatterina, PhD
Seth Lieberman, MD

Background:
Relative value units (RVU) are measures utilized to assess physician work, practice expenses, and professional liability. Among the existing subcategories the work RVU (wRVU) has been adopted as a surrogate marker for surgeon productivity and a basis for compensation. Previous studies have assessed the opportunity cost associated with resident and head and neck fellow training. The purpose of this study is to specifically investigate the impact of resident and fellow training on wRVU generation in sinonasal and anterior skull base surgery.

Methods:
The National Surgical Quality Improvement Program (NSQIP) is a validated, nationally representative sample of procedures performed at more than 700 sites throughout the United States. Over 1000 patients were identified who underwent common sinus surgeries including maxillary antrostomy and total ethmoidectomy, as well as anterior skull base procedures including endoscopic endonasal approach to pituitary tumor resection between 2005-2015. Data including demographic information such as gender, age, BMI, and medical comorbidities, as well as operative information such as length of procedure and wRVU generation will be extracted and analyzed from this database.

Results:
Statistical analysis is ongoing, we do not yet have reportable results. One way analysis of variance (ANOVA) will be utilized to compare wRVU generated per procedure performed by attending alone versus attending with fellow and attending with residents.

Conclusion:
While other studies have assessed the RVU compensation model in head and neck surgery, there is a need to specifically explore this model in sinonasal and anterior skull base surgery.

Poster #C157

**Timing of endoscopic surgery in CRS and patient outcomes: a systematic review and meta-analysis**

Chris Bell, MD, MPT
Jonathan Yip, MD
University of Calgary

Background:
There is conflicting evidence on the impact of timeliness of sinus surgery on the degree of perceived symptom improvement in chronic rhinosinusitis (CRS). The goal of this study was to systematically evaluate the available literature on the relationship between patient wait times for endoscopic sinus surgery (ESS) and post-operative changes in patient-reported outcome measures.

Methods:
Standard terms and synonyms for ESS, timing, and CRS were used to search databases including OVID, MEDLINE, CINAHL and Cochrane Library of Systematic Reviews between January 2000 to September 1, 2023. Inclusion criteria included original publications of adult patients with CRS undergoing ESS, cohorts of greater than 5 patients, and which utilized patient-reported outcome measures (pre and post-surgery) to determine the magnitude of improvement.

Results:
Two studies consisting of 1606 patients were included in the meta-analysis. A high degree of inter-rater reliability between study screening was observed ($k = 0.87$). A mean difference in SNOT-22 of -0.3 (95% CI = -3.9 to 3.3, $I2 = 89\%$, $p < 0.01$ was observed between "long" and "short" groups, while a mean difference in SNOT-22 of -0.1 (95% CI = -2.5 to 2.3, $I2 = 80\%$, $p = 0.03$) was observed between "long" and "mid" groups.

Conclusions:
There appears to be conflicting evidence to conclude whether timing of ESS impacts disease-specific quality of life in patients with CRS. However, patients who receive surgery earlier appear to have lower demands on health care utilization including health care visits and prescription use.

Poster #C158

**Tophaceous pseudogout presenting as an infratemporal fossa mass**

Ehiremen Iyoha, MD
Carlos Pinheiro Neto, MD
Mayo Clinic School of Medicine, Rochester, MN

Introduction:
Pseudogout is a condition characterized by the deposition of calcium pyrophosphate crystals. Though rare, involvement of the temporomandibular joint has been reported and when involved typically extends into the infratemporal fossa (ITF). Isolated pseudogout of the ITF is very rare. A quick PubMed search generated three case reports of tophaceous pseudogout isolated to the ITF between 1999 and 2010. We present a novel case of an ITF tophaceous pseudogout without involvement of the temporomandibular joint.

Case description:
A 70-year-old female presented to our institution for evaluation of a left parotid mass and was incidentally found to have a right infratemporal mass. She reported several week history of right jaw pain and intermittent right otalgia. The patient's medical and family histories were unremarkable. MRI demonstrated a 2.8 cm circumscribed right ITF mass, abutting foramen ovale without expansion and no involvement of the temporomandibular joint.
CT-guided biopsy of the infratemporal mass was obtained and demonstrated findings consistent with chondroma. The patient subsequently underwent endoscopic endonasal resection during which the tumor was noted to be partially encapsulated and invading the pterygoid musculature, making the resection quite challenging. However, histopathological diagnosis was tophaceous pseudogout.

Conclusion:
Tophaceous pseudogout of the ITF is very uncommon. Patients with this disease process may present with clinical and radiographic features that mimic benign or malignant neoplasms. Clinicians should include tophaceous pseudogout in their differential diagnosis when faced with ITF tumors.

Poster #C159

**Treatment approach to a case of juvenile psammomatoid ossifying fibroma**

Saima Wase, MD
Wesley Stepp, MD
Cristine Klatt-Cromwell, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, FARS
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
University of North Carolina-Chapel Hill

An 11-year-old African American male presented to the ED with a 6-month history of progressive vision loss and proptosis of the right eye. A computed tomography scan of the orbits and paranasal sinuses demonstrated a large mass displacing the right orbit and compressing the right optic nerve. Otolaryngology was consulted for a biopsy with concerns for rhabdomyosarcoma. Intraoperatively, the lesion was highly vascular and final histopathology demonstrated bony trabeculae, spindle cell stroma, and characteristic ossifying cementicles consistent with Juvenile Psammomatoid Ossifying Fibroma (JPOF). JPOF is a rare, benign, fibro-osseous neoplasm that arises in the orbit and/or paranasal sinus—most often in the pediatric population. While benign, orbital and skull base involvement complicates surgical management of the tumor. This patient presented with acute vision changes requiring emergent decompression of the orbit and had a second procedure to attempt clearance of the disease from the skull base, but due to the intense skull base involvement, small amounts of residual disease were left in place. Post-operatively, the patient remains asymptomatic with improved proptosis and near normal return of visual acuity 6 months after surgery.

Poster #C160

**Trends in biologic persistence among CRS patients**

Taylor J. Stack, BS
Saïf Zaidi, Medical Student
Aurelia S. Monk, BS
Meredith Meyer, Student
Sulgi Kim, Student
Cristine Klatt-Cromwell, MD
Charles S. Ebert, Jr., MD, FARS
Ibtisam Mohammad, MD
Brian J. Thorp, MD, FARS
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS
University of North Carolina - Chapel Hill

Background:
Reports of biologic discontinuation prevalence within the CRSwNP patient population are inconsistent and scarce. In light of this, we conducted a large-scale, claims-based analysis to compare the rates of discontinuation associated with these biologic treatments for CRSwNP.

Methods:
This IRB-approved claims-based study utilized the IBM MarketScan® Research Database to evaluate patients with CRS treated with the biologics dupilumab (300mg/2 weeks), omalizumab (150mg/2 weeks), or mepolizumab (100mg/4 weeks).

Results:
From 2019-2021, 1866 CRS patients on biologics for CRS met inclusion criteria (n, dupilimab=1494; n, omalizumab=213; and n, mepolizumab=159). Duration of continuous use was higher for dupilumab compared to omalizumab (605 vs. 233 days, $\chi^2$=110, p<0.001) and mepolizumab (605 vs. 308 days, $\chi^2$=46, p<0.001). There were also significant differences when comparing omalizumab and mepolizumab (233 vs. 308 days, $\chi^2$= 5, p=0.03). Omalizumab had the shortest duration of use at 233 days. Patients treated with dupilumab were more likely to be persistent to therapy compared with the other biologics combined (HR: 0.45, 95% CI=0.39-0.52, p<0.001). Between 2019-2021, 44,749 CRS patients underwent sinus surgery. Of those who underwent surgery, 4.17% (n=318/44,749) had previous or concurrent biologic use.

Conclusion:
Dupilumab users had longer median usage compared to omalizumab and mepolizumab users. Omalizumab had the highest probability of drug discontinuation. A small percentage of those who underwent sinus surgery were on a biologic at the time.

Poster #C161

**Trends in endoscopic sinus surgery and chronic rhinosinusitis in cystic fibrosis**

Roy Qu, MD
Nihal Punjabi, BS
Kristin Seiberling, MD
Christopher Church, MD, FARS
Loma Linda University Health

Background:
While the treatment of cystic fibrosis (CF) has dramatically changed in recent decades, little is known about how chronic rhinosinusitis (CRS) and endoscopic sinus surgery (ESS) rates have changed in the same period.
Objectives: To provide national estimates of CRS and ESS in pediatric and adult CF patients from 2004 – 2019

Study Design:
Retrospective inpatient cohort

Methods:
We used the National Inpatient Sample from 2004 – 2019 to describe trends in CRS and ESS in CF patients in the United States. Weighted demographic statistics and national estimates of ESS and CRS were calculated and compared between pediatric (age < 18) and adult patients and over time.

Results:
24,485 pediatric and 44,688 adult patients were included. From 2004 to 2019, the mean age for adults increased (27.6 vs 30.4 years, p < 0.001) while there was no difference in children (10.6 vs 10.6 years, p = 0.763). Rates of CRS increased for both children (14.1% vs 21.1%, p < 0.001) and adults (16.5% vs 40.9%, p < 0.001). In 2019, CRS rates in adults were twice that of children (40.9% vs 21.1%, p < 0.001), but there was no difference in 2004 (14.1% vs 16.5%, p = 0.061). From 2004 to 2019, rates of ESS declined for children (25.3% vs 3.4%, p < 0.001) and adults (12.3% vs 3.6%, p < 0.001) with CRS.

Conclusions:
Despite the rising prevalence of CRS in children and adults with CF, rates of inpatient ESS have decreased. This might reflect improved medical management and an aging adult population wherein CRS becomes a more common comorbidity.

Poster #C162

**Trends in nasal surgery**

Aurelia S. Monk, BA
Taylor J. Stack, BS
Virginia Pate
Cristine Klatt-Cromwell, MD
Brian J. Thorp, MD, FARS
Charles S. Ebert Jr., MD, FARS
Brent Senior, MD, FARS
Adam Kimple, MD, PhD, FARS

Introduction:
Functional endoscopic sinus surgery (FESS) has been the mainstay of management for recalcitrant chronic rhinosinusitis. However, alternative treatments like balloon sinuplasty and biologic modulators have emerged, changing the landscape of care.

Objective:
To determine rates of FESS, balloon sinuplasty, and septoplasty from 2001-2021.

Methods:
Using the IBM MarketScan® Research Database, we determined rates of FESS, balloon sinuplasty, and septoplasty by year. Statistical analysis was conducted using RStudio and GraphPad Prism 10.

Results:
In MarketScan, 508589 FESS and 606136 septoplasties were performed from 2001-2021. Balloon sinuplasty first appeared in MarketScan in 2011. From 2011 to 2021, 34521 balloon sinuplasties were performed. Balloon sinuplasty as a proportion of all sinus surgeries (FESS and balloon) showed a significant, positive trend (tau = 0.867, p-value = 0.00068) between 2011 and 2021. When normalized per 100,000 enrollees in MarketScan, balloon sinuplasty had a moderate positive trend (tau=0.564, p=0.0195). Both FESS and septoplasty had moderate negative trends (FESS: tau= -0.714, p=6.82e-06; septoplasty: tau= -0.619, p=9.80e-05).

Conclusion:
Balloon sinuplasty is gaining popularity relative to FESS. At this time, it is unclear the importance of these trends. However, recognizing and understanding these changes in treatment trends is critical to the socioeconomic impact of CRS.

Poster #C163

**Trends in surgical management of invasive fungal sinusitis before and after the COVID-19 pandemic**

Benjamin Bitner, MD
Sina Torabi, MD
Joel Feier
Theodore Nguyen, Medical Student
Jonathan Pang, MS
Lauren Roland, MD
Edward Kuan, MD, FARS
University of California Irvine Medical Center

Objectives:
The COVID-19 pandemic affected the epidemiology and treatment of many otolaryngology diseases. This study aims to compare the incidence and unique features of surgically treated invasive fungal sinusitis (IFS) before and after the start of the COVID-19 pandemic.

Methods:
The TriNetX database was queried for patients with IFS undergoing endoscopic sinus surgery for 3 years preceding (pre-COVID cohort) and 3 years after (post-COVID cohort) January 20, 2020.

Results:
A total of 590 and 501 patients in the pre- and post-COVID groups were compared. Post-COVID patients with IFS undergoing endoscopic sinus surgery were older (52±20.61) compared to pre-COVID patients (46.5±20.8), ($p<0.001$). A greater proportion of post-COVID patients were Hispanic or Latino (15% vs 8%, $p<0.001$). Voriconazole (51% vs 39%, $p<0.001$) and Itraconazole (12% vs 7%, $p=0.009$) were more commonly used to treat pre-COVID IFS patients. There was no difference in 3-month (82.92% vs 80.59%), 6-month (78.54% vs 74.98%), 1-year (71.40% vs 67.40%), or 3-year (59.24% vs 54.85%) overall survival (OS) between both cohorts. Pre- and post-COVID patients experienced similar rates of reoperation (30.65% vs 35.86%, odds ratio [OR]=0.79, 95% CI=0.60-1.04), emergency department visits (30.85% vs 30.35%, OR=1.02, 95% CI=0.77-1.35), readmission (12.70% vs 14.94%, OR=0.83, 95% CI=0.57-1.20). In 2020 Q2, surgical intervention of IFS decreased by 60%, and in 2021 Q4 (peak COVID19), operative volumes increased by 17.4% compared to corresponding pre-COVID quarters.

Conclusion:
Surgical treatment of IFS dramatically decreased during the beginning of the COVID-19 pandemic a steady recovery in cases since. There does not appear to be a change in OS since the COVID-19 pandemic.

Poster #C164
**Turbinate surgery in children**
Mattie Rosi-Schumacher, MD
Eugene Kern, MD
University of Buffalo

Background:
There is currently little evidence to support turbinate reduction surgery in children. The role of surgery, long-term effects on nasal airflow dynamics, and complications have not been properly studied. Objective: This essay examines the current evidence for inferior turbinate reduction surgery in children.

Methods:
A comprehensive review of literature from the PubMed database.

Results:
Various management options have been proposed to address turbinate hypertrophy including radiofrequency tissue reduction, electrocautery, cryotherapy, coblation, submucous microdebridement, resection, and out-fracture. The longest period of follow up in adults was documented in a 2003 paper by Passali et al. in which submucosal resection with lateral displacement demonstrated long-term normalization of nasal patency and restoration of mucociliary clearance after 6 years. Coblation and radiofrequency procedures have been shown to be less painful however their effectiveness decreased at 3 years. Turbinectomy is not supported by current evidence. Turbinate resection is irreversible, does not preserve nasal function, and carries a high risk of late atrophic rhinitis. Recent research has demonstrated the perception of nasal patency is mediated by TRPM8 channels present on the trigeminal nerve fiber endings within the nasal epithelium which go on to synapse in the respiratory center. Turbinate resection or cautery interferes with this normal signaling pathway and contributes to the sensation of nasal obstruction and the pathology of empty nose syndrome.

Conclusion:
Prospective randomized control trials with long-term follow up into adulthood are imperative to guide the surgical management of children with turbinate hypertrophy.

Poster #C165
**Utility of preoperative laboratory testing In elective transnasal pituitary surgery**
Sherron Thomas, BSA
Thomas Scharfenberger
Kareem Al-Mulki
Christina Fang, MD
Carina Himes, Assistant Professor
Vijay Agarwal, Associate Professor
Patrick Colley, MD
Nadeem Akbar, MD
Albert Einstein College of Medicine

Background:
Preoperative laboratory testing (PLTs) is routinely obtained for healthy patients undergoing surgery, but is often not correlated with improved outcomes or decreased complications. The objective of this study is to assess whether PLTs impact the outcomes of transnasal pituitary surgery in a low-risk patient population.

Methods:
The NSQIP Database was filtered to include elective transnasal pituitary adenoma surgeries from 2017-2021. Low-risk patients were identified as American Society of Anesthesiologist (ASA) class 1 and 2 patients. Patients were separated into two groups based on the presence of any PLT performed. Differences in medical and surgical complications between the groups were assessed with Chi-squared and T-tests appropriately.

Results:
487 patients met inclusion criteria with 455 of them having at least one PLT done (93.4%). The most common PLT was a complete blood count, performed on 91.6% of patients. 7.39% of pituitary adenoma cases had one major complication. There was no significant difference in complication rates for patients with no PLT and at least one PLT (6.25% vs 7.69%, $p = 0.766$). Specifically, there was no association between the use of PLT and superficial surgical site infections ($p = 0.645$), post-operative pneumonia ($p = 0.594$), urinary tract infections ($p = 0.513$), or strokes ($p = 0.707$). Additionally, there was no significant difference between mean length of hospital stay (2.84 vs 3.41 days, $p = 0.207$).

Conclusions:
While considering the limitations of the NSQIP database, our analysis did not reveal a significant association between the use of PLTs in low-risk patients and an increased risk of post-surgical complications.

Poster #C166
**Variations in research activity among 2023 rhinology fellows**
Andrew Lee, BA
Victoria Vought, BA
Rita Vought, BA
Ava Herzog
Mark Mascera
Haris Waseem, BS
Suat Kilic, MD
Jean Anderson Eloy, MD, FARS
Andrey Filimonov
NJMS

Background:
Research activity is a critical consideration in the evaluation and promotion of academic physicians in otolaryngology. In this study, we sought to characterize the research output, as measured by h-index and weighted relative citation ration (w-RCR), and impact, using mean-RCR (m-RCR), among 2023 rhinology fellows.

Methods:
Demographic data on 2023 rhinology fellows was collected using the American Rhinologic Society website and institutional websites. Fellows were searched on Scopus, and their number of publications, number of citations, dates of earliest and latest publications, and h-index were noted. Scopus data was also exported to the National Institutes of Health iCite website to calculate their m-RCR and w-RCR. Mann-Whitney and Kruskal-Wallis tests were utilized to determine statistical significance with an alpha value of 0.05.

Results:
Fellow data was available for 61% of United States rhinology fellowships (29 fellows). The average rhinology fellow published 18 papers over the course of 5.66 years with an average of 210 citations. The overall average h-index, m-RCR, and w-RCR were 5.45, 1.35, and 22.20, respectively. Evaluation by gender found that male fellows had higher H index, m-RCR, w-RCR, number of publications, number of years publishing, and citation numbers than female counterparts (p=0.05121, 0.169, 0.04235, 0.2042, 0.045, and 0.04075 respectively). No statistically significant differences were observed in comparisons of research activity by geographical location.

Conclusion:
Male fellows tend to have a higher average w-RCR but not h-index or m-RCR, indicating greater research output but not

Poster #C167
**Vasovagal reactions in the office**
Victor Kizhner, MD
Karen Wilson
Yosef Krespi, MD
Atlantic Health System

As medical devices and techniques evolve, targeting minimally invasive options, office procedures increase, primarily in rhinology. However, as otolaryngology is intervention heavy during office procedures, vasovagal (VS) reactions are not uncommon. VS is the most common reflex syncope with depression of cardiac output as well as a decrease in vascular tone resulting in transient loss of consciousness. VS carries a likelihood of 33% during one's lifetime. Pain and stress are known triggers for VS.

Objectives:
Identify, stratify and create a treatment algorithm for VS in the office.

Methods:
Literature review

Results:
Athletes, younger population, patients with intact autonomus nervous system and previous history of VS present a higher risk for VS. Patients should be stratified into a full VS or presyncope.

Recommendations:
Prior to an office intervention a VS targeted history and physical should be obtained.
Former reaction to pain, blood or procedures is noted. Antihypertensives, antihistamines, anticholinergics, anticoagulants can complicate VS. A presyncope should be differentiated from a full VS. Full VS requires a thorough exam with a further referral to primary care. Immediate care should include
placing the patient in a supine position and cooling down. Ammonia may be used for full VS but is rarely needed. Vitals should be repeated and full recovery within 20 minutes is expected. Should the patient sustain a head injury a trauma referral is warranted. A prior estimate of time and location (e.g. nasal procedure more likely to result in VS over an oral procedure) may allow a better reaction to VS.

Poster #C168
**Vestibular stenosis following nasal cannula fire**
Kue Lee, BS
Victoria N. Huynh
Abdullah Chandasi
Kareem Haroun
Camillo Reyes, MD, FARS

Introduction:
Vestibular stenosis is a rare and incapacitating form of nasal blockage. Common causes include nasal trauma, infection, and iatrogenic injury. Accompanying complications include nasal obstruction, chronic sinusitis, sleep disturbances, reduced sense of smell, and nasal crusting and epistaxis. Diagnosis is typically made following physical examination of external nasal structures. Widening of nasal passages via nasal speculum to examine internal nasal structures as well as nasal endoscopy are also common diagnostic tools. This case is highly unique because it demonstrates the risk of nasal cannulated oxygen, and the complications that can arise from smoking with home oxygen.

Methods:
Case report with literature review

Case:
A 64-year-old female presented with nasal obstruction, mid-facial pain, difficulty breathing and inability to use her nasal canula following a nasal burn after her nasal oxygen cannula caught on fire while smoking a cigarette. On exam, the right nostril was completely stenosed without any opening. A CT maxillofacial without contrast revealed complete vestibular stenosis, with no other significant septal deviation or sinonasal disease. Right nasal endoscopy revealed intact but minimally deviated septum without any mucosal changes. Patient underwent reconstruction repair of the right nasal vestibular stenosis with full thickness skin graft and external nasal valve repair.

Conclusion:
Vestibular stenosis is a significant type of nasal obstruction that can occur following nasal trauma. We demonstrate a unique case of vestibular stenosis following a nasal burn resulting from combustion of nasal cannula. Risk of recurrence as a result of wound contracture is often high in cases of vesti

Poster #C169
**Vivaer: A correlation between symptom scores and objective findings**
Auddie Sweis, MD
Joseph Raviv, MD
Riley Medenwald, Research Coordinator
NorthShore University HealthSystem

Introduction:
Nasal obstruction that is unresponsive to standard medical therapy may improve in response to the minimally-invasive VivAer. A multi-center, prospective study showed significant improvement in patients' sleep quality, ability to breathe through their nose, and overall NOSE scores. These results were only based on patient symptom scores. In an ongoing study, we assess objective improvement in nasal airflow secondary to the VivAer procedure in addition to patient questionnaires before and after the VivAer procedure.

Methods:
From 10/2022 through the present, we conducted baseline measurements on or before the day of the procedure using PNIF meters and the SNOT-22 and NOSE questionnaires. These measurements were then repeated at 1, 3, and 6 months post-procedure.

Results:
Participants (n=7) were 71% female and 61±8 years of age. Participants experienced improved PNIF scores by the 3-month follow up ($p=0.0313$). Patients also experienced improvement in NOSE ($p=0.0496$) and SNOT-22 ($p=0.0313$) scores by the 1-month and 3-month follow-ups respectively.

Conclusion:
Although the study is still ongoing, the VivAer procedure shows promise as a minimally-invasive alternative to surgery to address nasal obstruction. While the sample size remains small, the preliminary results of the study have shown positive trends in all measured outcomes in all participants. Patients experienced enhanced nasal patency, along with improvements in NOSE and SNOT-22 scores, attesting to the potential benefits of the procedure.

Poster #C170
**WITHDRAWN**

Poster #C171
**Wearable health tech/apps for ENT research-logistics, challenges and implementation**
Amrita Ray, MD, FARS
Mohamed Aboueisha, MD
Sebastian Gulka, Medical Student
David Cvancara, BS
Ashton E. Lehmann, MD
John Paul Giliberto
Ian Humphreys, DO, FARS
Waleed Abuzeid, MBBS, FARS
Aria Jafari, MD, FARS
Henry Ford Health System

Wearable health technology and apps have exploded in the recent decade and are poised to revolutionize how we collect objective and subjective patient data and conduct patient research.

However, incorporation of these (private) technologies into clinical and academic settings poses a challenge. This talk will provide a detailed overview on how health technology is already being utilized in aspects of medicine and where this technology is poised to expand. We will examine current novel applications of health devices/apps in medicine and how these can be tailored to otolaryngologists in particular. Additionally, we will cover factors such as implementation logistics, legal and privacy challenges, and data repository and extraction limitations to consider. Finally, we will discuss some of the challenges in tech development and explore some of the commercially available products that may be appropriate for use in an ENT clinical or research environment.

Poster #C172

**Web-based patient-generated health data collection tool in rhinologic care**

Mohamed Aboueisha, MD
Sebastian Gulka, Medical Student
David Cvancara, BS
Ashton E. Lehmann, MD
John Paul Giliberto
Ian Humphreys, DO, FARS
Waleed Abuzeid, MBBS, FARS
Aria Jafari, MD, FARS
University of Washington

Introduction:
Patient-generated health data (PGHD), encompassing health history, symptoms, and patient-reported outcome measures (PROMs), play a key role in the evaluation and management of patients with sinonasal conditions. This study aims to assess the integration and impact of a novel PGHD collection tool in rhinologic care.

Methods:
We developed the web-based, pre-visit Computerized Adaptive Sinus Intake (CASI) PGHD tool, which captures sinonasal history, symptoms, and quality of life and administers additional symptom-directed PROMs based on patient responses. CASI was implemented in our tertiary rhinology clinic between 7/2021 and 7/2023. We assessed completion rate and time, staff and provider perspectives, and the effect on clinical workflow.

Results:
Of 7,451 patients, 5,819 (78.1%) completed CASI, with a mean completion time of 5.4 minutes. Completion likelihood was not influenced by demographic factors. Staff (n=8) unanimously reported that CASI integrated well into clinic workflow, with 87% stating it saved administrative time. Providers (n=3) reported that CASI accurately captured patient complaints and streamlined documentation. Following implementation, provider documentation time significantly decreased from 10.4(95%CI;6.1,14.6) to 5.3(95%CI;4.8,5.8) minutes per patient, (p=0.001), as did the rate of manual note composition from 72.9% to 46.4%, (p=0.001).

Conclusion:
The CASI tool integrates well into rhinology clinic workflow with a high completion rate, favorable staff and provider reception, enhanced visit efficiency, and reduced provider documentation burden. Further research is needed to explore how the tool may inform decision-making, treatment progress, and enhance the patient-provider relationship.

# SAVE THE DATE 2024


Meeting Registration: https://registration.socio.events/e/sss2024
Housing: https://www.hyatt.com/en-us/group-booking/MSYRN/G-RHIN

## ARS 13th Annual Summer Sinus Symposium

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

### July 12-14, 2024

### Hyatt Regency New Orleans
### New Orleans, LA

**Highlights:**

- Women in Rhinology Networking Event
- Cadaver Prosections
- Allergy Program
- Signature Event
- Symposia Sessions

Housing: https://book.passkey.com/e/50763947

## ARS 70th Annual Meeting

### September 27-28, 2024

### Fontainebleau Miami Beach
### Miami, FL

**Highlights:**

- 20th David Kennedy Lectureship
- Women in Rhinology, Mentorship, Residents & Fellows, and Diversity Programs
- Symposia Sessions
- Fall Film FESStival
- Guest Countries
- 3rd Annual Hwang Family Lecture

**Contact: Wendi Perez, ARS Executive Administrator**
**Tel: 973-545-2735, Ext. 4105 Email: wendi@american-rhinologic.org**

**american-rhinologic.org**

**Twitter / Facebook / Instagram:** *@amrhinosociety*