

**Unlocking the secrets of smell.**  
How researchers are teaming up to study  
smell loss in chronic sinusitis.  
(page 10)

*EN Williams*



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# the SCOPE

MUSC Department of Otolaryngology | Head & Neck Surgery



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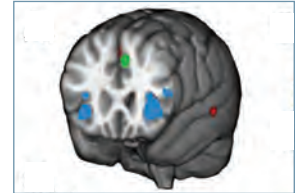
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Cover illustration by Elizabeth Northcut Williams



## Chairman's Corner

This edition of the SCOPE presents a new format and celebrates our research mission, which has been a pillar of strength for our Department for more than 40 years. Below is a brief historical perspective and current status report.

- The Department traces its beginning to the appointment of Edward Parker, M.D. as Professor of Ophthalmology and Otology. In 2011 we celebrated our 100th year.
- The first full-time chair of the Department was Richard Hankel, M.D., appointed in 1960. Two chairs have led the Department since then – Warren K. Adkins, M.D. 1978 to 1998, and Paul R. Lambert, M.D. 1999 to present.
- The first RO1 was granted in 1975 and our Program Project Grant in auditory neuroscience followed 12 years later. Remarkably, the Program Project Grant just celebrated its 30th year of funding.
- For over 20 years the Department has ranked within the top 12 for NIH support with a diverse portfolio including allergy and immunology, cancer, and speech/swallowing in addition to auditory neuroscience.
- These basic and clinical science investigations are now supplemented with one of the most robust clinical trials programs in the country.
- In addition to our 6 Ph.D. faculty, we have four clinician scientists with either RO1 or NIH-K support.
- Our T-32 Grant offers diverse research opportunities for medical, graduate, and post-doctoral students; and post-residency fellows.
- Extramural funding for FY 2018 exceeds \$5.0 million (23 awards), and currently we are involved in 21 clinical trials.

We are immensely proud of our efforts to add new knowledge to the field and to train the next generation of investigators. I hope you will enjoy reading about the five research programs we have chosen to highlight.

*Paul R. Lambert, M.D.*

Paul R. Lambert, M.D.  
Professor and Chair  
Department of Otolaryngology - Head & Neck Surgery  
Director, Otology & Neurotology



## CONTINUING EDUCATION



### The 31st Annual F. Johnson Putney Lectureship in Head & Neck Cancer

This half-day lectureship was held on November 11, 2016 under the direction of **Terry A. Day, M.D.** The keynote speaker was **Jeffrey N. Myers, M.D., Ph.D, FACS**, Professor, Department of Head & Neck Surgery at the University of Texas MD Anderson Cancer Center, Houston, Texas. Participants came from six states to hear world class Head and Neck specialists discuss the latest information and guidelines ranging from education to head and neck surgical anatomy to management of supraglottic and other cancers.



### The Charleston Pediatric ENT Update

The fourth annual Charleston Pediatric ENT Update, directed by **David R. White, M.D.**, was held February 11, 2017 at the Courtyard Marriott Historic District. This comprehensive full-day course for pediatricians, family practitioners, and otolaryngologists provided up-to-date guidelines to implement into daily practice, promote quality and efficient care, and tackle challenging ENT diagnoses with confidence. The keynote speaker was **Sanjay R. Parikh, M.D.**, Medical Director, Pediatric Otolaryngology, Seattle Children's Hospital, Seattle, Washington. Participants came from 14 states to attend, traveling from as far as California.

## The Temporal Bone Dissection Course

The sixteenth Temporal Bone Dissection Course was held on March 24-25, 2017 on the MUSC campus, directed by **Ted A. Meyer, M.D, Ph.D.** This course, designed for practicing otolaryngologists, focused on procedures for chronic ear disease and included hands-on training in our temporal bone dissection lab. Distinguished guest speaker was **John C. Goddard, M.D.**, Otology, Neurotology, Skull Base Surgery Northwest Permanente, PC, Kaiser Permanente-Northwest, Portland, OR. The course was well attended by practitioners traveling from six states.



## Southern States Rhinology Course

This three day course held March 29 to April 1, 2017 at Kiawah Island Resort and the MUSC campus provided a comprehensive update on the medical and surgical practices of rhinology for practicing rhinologists and sinus surgeons. The course included a hands-on dissection laboratory, featuring state-of-the-art endoscopic instrumentation, video, and image guidance systems. Lab Director: **Rodney J. Schlosser, M.D.** We hope you will join us in May 3 - 5, 2018 when our guest of honor will be **David Kennedy, M.D.** from University of Pennsylvania.

## 17th Annual Charleston Magnolia Conference

Our distinguished guest speakers for the 17th Annual Charleston Magnolia Conference held June 2-3, 2017 were **Richard Harvey, M.D.**, Program Head and Professor, Rhinology and Skull Base, Sydney, New South Wales, Australia; **Lisa E. Ishii, M.D., MHS**, Associate Professor, Department of Otolaryngology - Head & Neck Surgery, Johns Hopkins Medicine, Baltimore, MD; **Steven A. Telian, M.D.**, University of Michigan, Ann Arbor, MI. Participants came from 17 states for the presentations and round table lunch discussions covering the breadth of our specialty. This course was directed by **Paul R. Lambert, M.D.** The weather was ideal, providing the perfect setting to enjoy historic Charleston, the beaches, golf, and the Spoleto Festival USA. Our 2018 course will be June 1-2, 2018, a great time to come to Charleston!



## The Charleston Course, 7th Annual Otolaryngology Literature Update

The Department hosted its 7th Annual Literature Update Course on July 14 - 16, 2016 at the beautiful Kiawah Island Golf Resort. Over 45 Otolaryngologists representing 12 states enjoyed the two-and-a-half days of our faculty critically analyzing the year's most relevant, evidence-based medical literature. The course was directed by **Paul R. Lambert, M.D.** Afternoons were free to enjoy the beaches, golf, tennis, restaurants and many other activities on the island, or to take a short drive into historic downtown Charleston. Next year's course will be held on July 13-15, 2018, again at Kiawah. We hope you will join us, and bring the family to experience all the area has to offer.

## MUSC appoints new MUSC Children’s Health Surgeon-in-Chief



and Women’s Integrated Center of Clinical Excellence (ICCE) and will lead this clinical entity in developing strategic initiatives towards growth in inpatient and ambulatory surgeries. He will be involved in the day-to-day operational management of surgical services in the Children’s and Women’s ICCE and will directly interface with Health System Administration, Department Chairs, Nursing leadership and all other relevant departments and divisions in the clinical enterprise.

**David R. White, M.D.**, Professor and the Director of Pediatric Otolaryngology at MUSC has been named MUSC Children’s Health Surgeon-in-Chief.

In this new role, Dr. White will represent all pediatric/ congenital surgical specialties within the Children’s

In addition, Dr. White will be charged with leading value-driven initiatives for surgical services to include the development, maintenance and improvement in quality outcomes, cost analysis, reduction and containment, and increases in surgical volumes.

## HONORS & AWARDS

**Clarice S. Clemmens, M.D.**

- MUSC IP 710 Outstanding Facilitator for 2017

**Betsy K. Davis, DMD, MS**

- MUSC Alumni Award of Honor, May 2017
- Awarded full Professorship

**Terry A. Day, M.D.**

- Director, Head & Neck Tumor Center, Hollings Cancer Center

**Paul R. Lambert, M.D.**

- Guest Professor, Georgetown University

**Ted R. McRackan, M.D.**

- American Cochlear Implant Alliance grant awarded
- Doris Duke grant renewed
- Joined Otology and Neurotology Editorial Board

**David M. Neskey, M.D.**

- MUSC Hollings Cancer Center Clinical Scholar
- Opened an investigator initiated trial: Phase II trial of Nivolumab as a novel neoadjuvant pre-surgical therapy for locally advanced oral cavity cancer

**Krishna G. Patel, M.D., Ph.D.**

- Visiting Professor, LSU, January 2017

**Habib G. Rizk, M.D., MSc**

- AAO-HNSF MDG Representative on the American Association of Neurology panel to develop a neurotology quality measurement set.

**Rodney J. Schlosser, M.D.**

- AAOHNS Distinguished Service Award
- ABOto Senior examiner
- Chandler Speaker, University of Miami, “Redefining FESS Success”, Miami, FL, June 2017

**Susan Teubner-Rhodes, Ph.D.**

- Invited to participate in the October, 2017 Workshop “Sensory Impairment and Cognitive Decline,” co-sponsored by NIH/National Institute on Aging

**David R. White, M.D.**

- MUSC Children’s Health Surgeon-in-Chief

# Bringing Complete Cleft Lip and Palate Care to Underserved Populations of the World

Krishna G. Patel, M.D., Ph.D.

Overseas medical outreach trips have many rewarding experiences; arguably it is most rewarding for those who volunteer and have the privilege to help people from around the world. One of the greatest challenges that we face is how to deliver the same quality of care to an overseas location that we offer within our home institution, especially in the setting of limited resources. There are many outreach medical delivery models and to date, there is no gold standard. I am honored to be a part of the non-profit organization, Global Smile Foundation, that is committed to providing this level of care. This organization is made up of the multi-specialties involved in cleft lip and palate care. The team travels to underserved areas of the world and offers all components of cleft care needed from birth through adulthood. This ranges from surgical repairs for the cleft lip/palate and skeletal deformities, feeding and speech education from the speech pathologist, as well as servicing the dental and orthodontic needs. However, there is so much more than the medical services that makes this outreach group so impactful.

## GOALS OF OUTREACH

**Continuity is one of the most important goals.**

We travel to the same hospital, the same week of the year, with 80 percent of the same staff, and work with the same local team. The benefits of this is that the family always knows that we will be present that time. Thus, if they do not have a means to communicate (phone or email), they know they can always find us in this location every year. The simple process of communication can be an enormous hurdle with families who do not have a reliable address or phone number. Once the patients reach the clinic and team, great efforts are taken to provide the surgical and nonsurgical needs that week. This requires the generosity of the local medical hospital and staff to allow resources to be used. Thus it requires enormous volunteer services from the local community as well. Global Smile Foundation relies equally on local team



Top image: Baby Josue before his cleft lip and palate repair. Middle image: Mother, Josue and Krishna Patel two years after his cleft lip repair. Bottom image: Krishna Patel and Josue during the annual clinic visit four years after his lip repair. Josue follows up every year to undergo his comprehensive cleft care treatment.

# High Resolution Pharyngoesophageal Manometry: An Emerging Technology for Dysphagia Evaluation and Management

Ashli K. O'Rourke, M.D.

Oropharyngeal dysphagia can be devastating for patients and a challenging clinical entity for providers. Videofluoroscopic imaging (i.e. the modified barium swallow study or MBSS) is considered the gold standard in evaluating oropharyngeal swallowing but drawbacks include radiation, costs of transportation and access, and lack of objective measures of function. There are also diagnostic questions that can be difficult to answer with traditional modalities alone, such as the interplay between cricopharyngeal dysfunction and pharyngeal deficits or the impact of esophageal dysfunction on patient complaints. From a therapeutic standpoint, traditional strength based training and compensatory strategies can be difficult for patients to correctly implement and therapists oftentimes lack the ability to assess and correct these deficits in implementation.

High-resolution pharyngeal manometry (HRPM) is a promising emerging technology that can be beneficial in both a diagnostic and therapeutic capacity. HRPM measures the intraluminal pressure activity of the pharynx, providing an objective representation of

muscular and sphincteric function. Pressure data are captured by a 36 channel catheter with closely spaced circumferential sensors and displayed as color-coded pressure representations of pharyngoesophageal function (**Figure 1**).

## Diagnostic Utility

The Evelyn Trammell Institute of Voice and Swallowing at the Medical University of South Carolina is at the forefront of exploring innovative diagnostic and therapeutic uses for pharyngeal manometry. Simultaneous videomanometry, in which a traditional MBSS is completed with concurrent pharyngoesophageal manometry, is commonly used in our Center (**Figure 2**). Our research has shown that certain HRPM parameters, such as the Pharyngeal Contractile Integral, correlate well with deficits seen on videofluoroscopy (**Figure 3**). We also found that patients with higher pharyngeal contractility (better function) had significantly less penetration and/or aspiration than those with lower contractility.

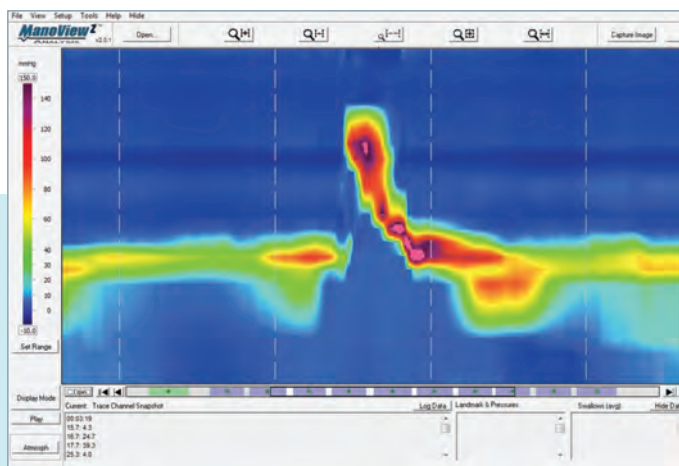


Figure 1: An example of a topographical pressure plot of a pharyngeal swallow captured by high-resolution manometry. Higher pressures are represented by warmer colors such as red or magenta. Lower pressures are denoted in blue or light green.

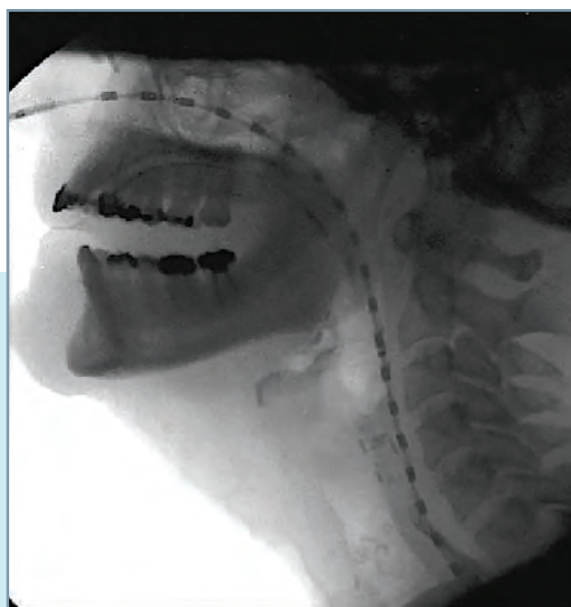


Figure 2: A still from a videofluoroscopic swallowing study showing the manometry catheter inserted through the nasal cavity and into the esophagus.



### Therapeutic Advances

Another powerful application of HRPB is its utilization as a biofeedback modality during traditional swallowing therapy. HRPB allows patients to visualize the swallowing process in an intuitive way to see how different maneuvers can change pharyngeal swallowing physiology. Patients can practice these maneuvers to obtain optimal exercise and compensatory techniques in real time. This visual feedback reinforces a more accurate replication of exercises and strategies in the home setting. It also provides an objective measurement of improvement during and following therapy (Figure 4).

### Summary

In our experience, HRPB is well tolerated and results in high patient and clinician satisfaction. We utilize HRPB as an adjuvant measure of pharyngeal function, in treatment sessions as biofeedback, and to evaluate the efficacy of our behavioral and surgical interventions. Our Center is continuing to work with industry to create and test pharyngeal manometry software and leads an international working group to further the clinical applications of this promising technology.



Ashli K. O'Rourke, M.D., Associate Professor

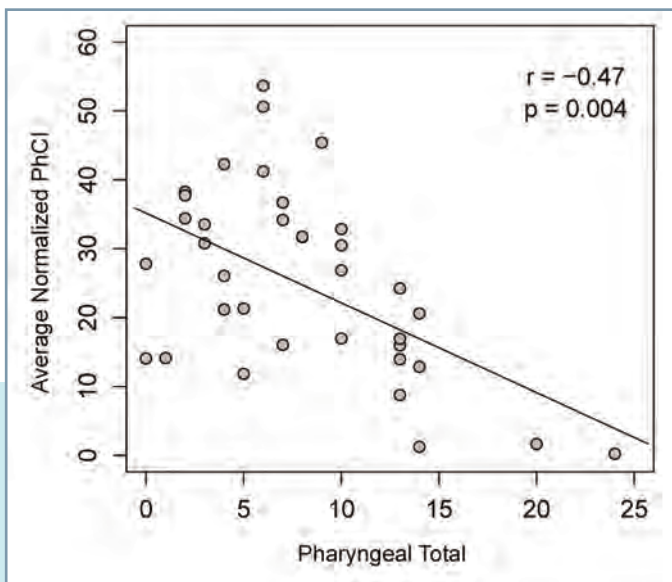


Figure 3: Spearman correlation plot revealing a significant negative correlation between pharyngeal contractile integral (Y-axis) and pharyngeal total scores (X-Axis) from the Modified Barium Swallow Impairment Profile (Northern Speech Services, Gaylord, MI, USA). This indicates that as pharyngeal contractility decreases, worse function is also noted on videofluoroscopy.

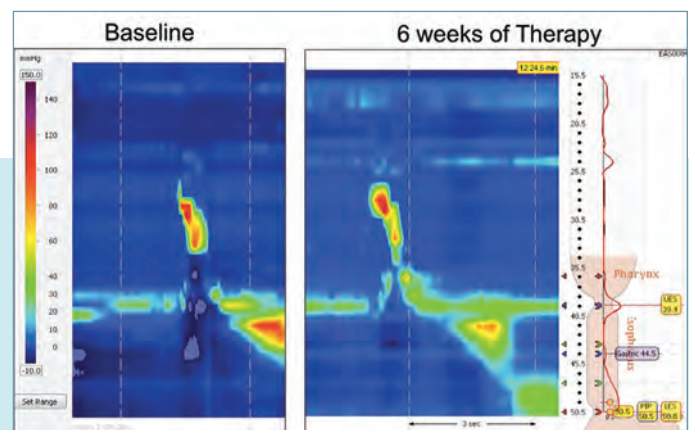
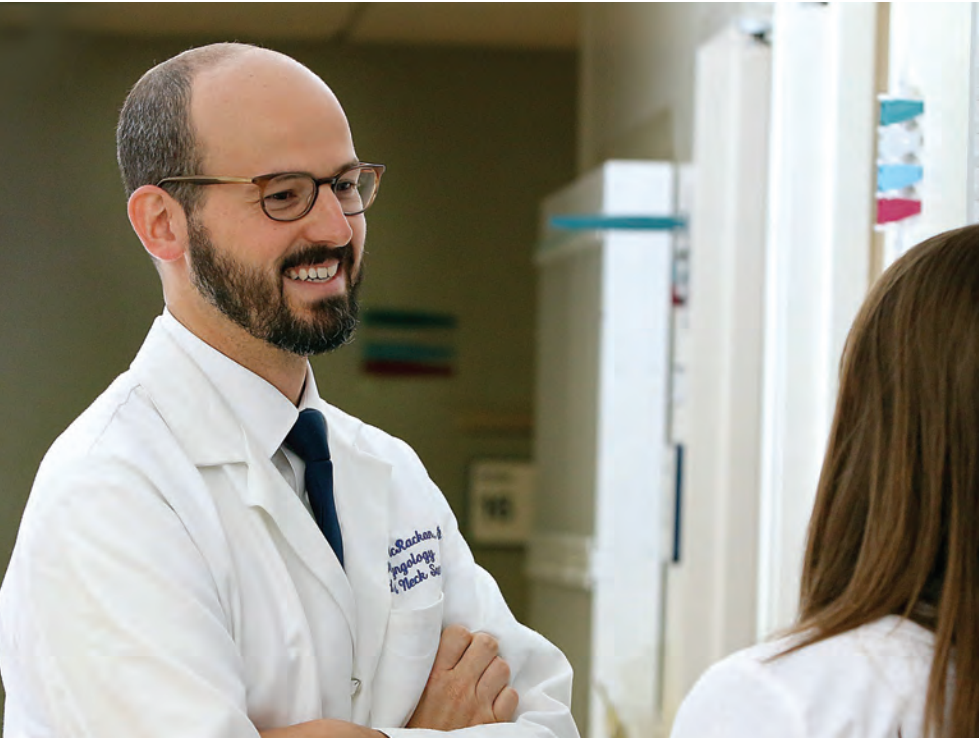


Figure 4: Increases in pharyngeal pressures are noted in a patient who underwent six weeks of high-resolution manometry assisted biofeedback therapy at our Center. Our protocol involves once weekly biofeedback therapy sessions with a concurrent daily home therapy program.

# Quality of Life in Adult Cochlear Implantation

Ted R. McRackan, M.D.



Cochlear implantation is the standard of care for patients with bilateral severe-to-profound sensorineural hearing loss. Based on increased numbers of adults with hearing loss due to an aging population and changing cochlear implant (CI) indications, the number of adult CIs performed annually continues to increase. Word and sentence recognition ability are the primary outcome measures used to assess CI outcomes. While important, these do not capture the diverse listening and communication experiences of CI users. Moreover, outcomes reported using these test batteries are characterized by large and unexplained individual differences and often are poorly correlated with CI user self-report of real-world communication abilities.

Two recent meta-analyses performed by our group have highlighted the disconnect between patient self-report and their speech recognition ability. Our work revealed negligible to low positive correlations (0.20 – 0.34) between speech recognition scores (words in quiet, sentences in quiet, and sentences in noise) and quality of life (QOL) measured using CI-specific, hearing-specific, and general health-related QOL measures

(Table 1). Thus, speech recognition scores accounted for only 4.0% to 11.6% of the variance in self-reported QOL. Clearly, how people who use CIs listen, communicate and interact with their changing environments is far more complex than revealed by commonly used speech recognition tasks, even tasks that include background noise.

Health-related quality of life (HRQOL) instruments have become increasingly important in understanding the impact of a medical intervention on a patient's life. Patient-reported outcome measures (PROMs) are instruments devised to capture a patient's perspective about their overall health or treatment. The use of PROMs to assess QOL allows direct input from the affected population about how disease processes and interventions impact patients' lives. The importance of PROMs is perhaps best highlighted by the Center

for Medicaid and Medicare Services (CMS) targeting QOL improvement as a primary outcome measure in the Quality Strategy Report and the FDA requirement that PROMs be included in all clinical trials where an intervention seeks FDA approval.

	<b>r</b>	<b>95% CI</b>
<b>CI-specific QOL</b>		
Word recognition in quiet	0.213	0.117 – 0.304
Sentence recognition in quiet	0.241	0.0830 – 0.386
Sentence recognition in noise	0.255	-0.0783 – 0.537
<b>Hearing-specific QOL</b>		
Word recognition in quiet	0.276	0.142 – 0.367
Sentence recognition in quiet	0.204	0.0701 – 0.330
Sentence recognition in noise	NA	NA
<b>HRQOL</b>		
Word recognition in quiet	0.330	0.191 – 0.456
Sentence recognition in quiet	0.335	0.180 – 0.475
Sentence recognition in noise	0.323	0.193 – 0.442

Numerous studies have shown the positive effects of CI on QOL, but there is no universally accepted QOL instrument for CI patients. Some CI studies have used hearing-specific QOL instruments, but these have not been validated in CI patients. Even the few CI-specific QOL instruments available do not meet modern development standards. The NIH established the Patient-Reported Outcomes Measurement Information System (PROMIS) in 2004 to develop, evaluate, and disseminate PROMs that assess well-being from a patient perspective. Since that time, PROMIS has established rigorous and clear guidelines for how PROMs should be developed and validated. No hearing or CI-specific PROM has been developed using these methods.

Following these guidelines, our team has made significant progress in developing a new CI-specific QOL instrument for adults, including: systematic literature search, patient focus groups, and cognitive interviews. During the focus groups, several topics were identified as important to CI users, which have not been included in previous hearing-specific or CI-specific QOL instruments, including functional independence, sound clarity, listening effort, and sense of work function ability. This provides early evidence that using patient focus groups, rather than expert panels, to create the initial item pool may uncover topics that have been previously unknown or ignored. Based on the coded focus group transcripts, the final construct of QOL in adult CI users was composed of the central themes seen in **Figure 1**.

We are currently performing the psychometric analysis of this item pool in order to develop the final QOL instruments. This analysis requires a large sample. To



Figure 1: Central themes from adult CI focus groups.

assist with patient recruitment, we have established the Cochlear Implant Quality of Life Development Consortium, which includes 20 CI centers that represent all regions of the US (**Figure 2**). This recruitment plan also ensures a diverse sample with respect to age, sex, race, ethnicity, CI listening modalities, and communication abilities. We will then work to perform the final validation of the newly developed QOL instruments and implement them in the clinical and research settings.

The results of this research program will expand outcome measures related to cochlear implantation beyond speech recognition ability to better understand the communication, social, emotional and other experiences of CI users. In doing so, we aim to fundamentally change how CI outcomes are measured and reported. A CI-QOL instrument with increased precision and responsiveness will be a valuable measurement tool for future clinical trials involving adult CI patients. We are excited about the future of this work and believe it is the beginning of a more comprehensive and patient-centered era of reporting CI patient outcomes.

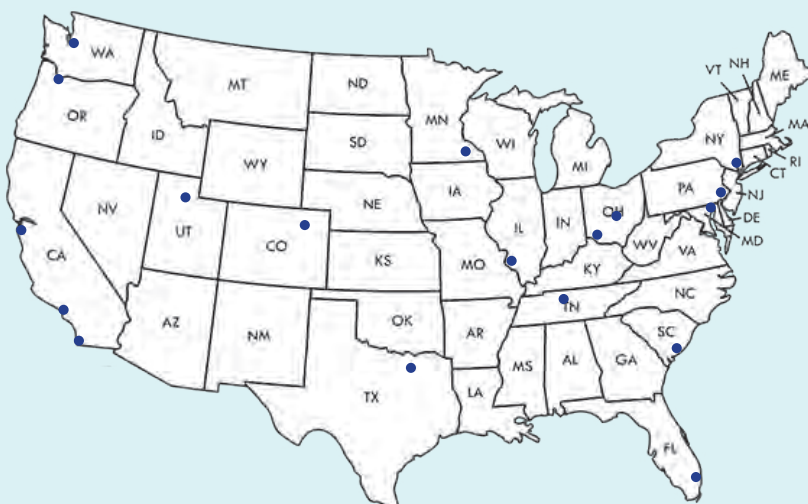


Figure 2: Collaborative sites for subject enrollment: Columbia University, Johns Hopkins University, House Ear Clinic, Kaiser Health Los Angeles, Kaiser Health San Diego, Mayo Clinic Rochester, Medical University of South Carolina, Ohio State University, Oregon Health Sciences University, Stanford University, University of Cincinnati, University of Colorado, University of Maryland, University of Pennsylvania, University of Utah, University of Texas Southwestern, Vanderbilt University, Virginia Mason Seattle, University of Miami, Washington University in Saint Louis

# Impacts of Chronic Rhinosinusitis

Sinus Center researchers integrate clinical and benchtop research to advance understanding of sinus disease

**Rodney J. Schlosser, M.D.**  
**Zachary M. Soler, M.D., MSc**  
**Jennifer K. Mulligan, Ph.D.**

Chronic rhinosinusitis (CRS) is an inflammatory disease of the nose and sinuses which can impact upwards of ten percent of the worldwide adult population. Although rarely life threatening, patients often suffer from impaired quality of life which drives them to seek medical treatment and sometimes even surgery. Most patients and providers focus on familiar symptoms such as nasal congestion, facial pain/pressure, and discolored drainage. However, an abundance of recent research demonstrates that the impacts of CRS extend far beyond the traditional symptoms of sinusitis.

## A team approach to studying CRS

Many great research centers study CRS, but most often they specialize in either basic science, benchtop research or purely clinical studies. The MUSC Sinus Center prides itself on a team-centered approach. Led by Rodney J. Schlosser M.D., the Director of the Division of Rhinology and Sinus Surgery, the research team includes both a robust clinical trials program and the ability to conduct basic research in the laboratory.

Dr. Schlosser says, “this approach allows researchers to design clinical trials that study direct impacts upon actual patients, but also allow tissue samples to be taken to the lab and analyzed in order to determine the underlying causes of CRS and potential novel therapies.” The clinical research program is run by Zachary M. Soler, M.D., MSc, a rhinologist and epidemiologist who specializes in CRS, and includes a clinical research coordinator, research fellows, and student interns.



Drs. Rodney Schlosser and Zachary Soler

Patients are often enrolled into prospective studies that investigate their particular disease and its impacts. During the course of these studies, patients may choose to donate tissue samples to be utilized in the laboratory. The MUSC Sinus Center laboratory is run by Jennifer K. Mulligan, Ph.D., an immunology researcher with particular interest in upper airway immunity. The ability to investigate tissues in the laboratory and integrate these findings with existing clinical patient data is a powerful tool. The bedside-to-bench and back again research paradigm is currently being utilized to study several specific areas related to CRS, including smell loss, poor sleep/cognition, and the impacts of local Vitamin D metabolism.

### Clinical trials in CRS

While many patients with CRS improve after medical therapy or endoscopic sinus surgery, around 20 percent seem to remain particularly recalcitrant to our current standard therapies. The MUSC Sinus Center is one of the most active clinical trials sites in the US. The center has recently participated in studies examining novel devices for delivery of aerosolized steroid, placement of in office drug eluting stents, and several trials investigating the use of monoclonal antibodies for these challenging patients. A number of future studies using novel anti-inflammatory agents are also in the planning stages. The clinical trials research team is headed by Shaun Nguyen, M.D., who leads three research fellows dedicated to rhinology research.

### CRS is not just about the nose

Researchers at the MUSC Sinus Center have focused on less recognizable symptoms of CRS such as smell loss, poor sleep quality, and impaired cognitive function. Interestingly, these symptoms tend to be particularly bothersome to patients. In fact, these impacts contribute most significantly to a patient's overall perception of their health state and are actually most likely to impact treatment decisions, such as the choice to have sinus surgery.

### Loss of smell is common in CRS but poorly understood

Between 30 to 70 percent of patients with CRS will have impaired ability to smell, but little research has been dedicated to understanding why this smell loss occurs and predicting whether patients will have improvement after medical or surgical treatments. Over the last

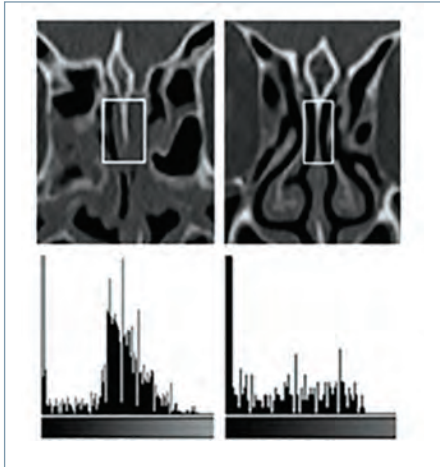


several years, researchers at the MUSC Sinus Center developed several techniques to better investigate the olfactory cleft, including volumetric CT analysis, the Olfactory Cleft Endoscopy Scale, and a novel method of sampling olfactory mucus via targeted sponge placement. One example is a recently published article demonstrating that novel olfactory cleft CT assessments correlate with olfactory function in polyp patients, but not in those without polyps, indicating unique mechanisms of olfactory loss.

The MUSC Sinus Center is now co-leading a team of researchers at four sites across the US that will enroll 1000 patients with CRS and comprehensively study their ability to smell. This five-year NIH-supported study is investigating the inflammatory cytokine profile of the olfactory cleft and will utilize cluster analysis and proteomics to separate patients into relevant subgroups based on a host of olfactory-specific metrics. Patients' ability to smell will then be assessed after various treatments. The expectation is that distinct subgroups of patients can be identified which will guide treatment selection and improve insights into mechanisms of disease.

### Patients with CRS often have poor sleep quality and impaired cognitive function

It is common for patients with CRS to describe feeling fatigued, suffering from poor sleep quality, and having problems with memory and concentration. However, it remained unclear whether these are merely subjective complaints, or whether actual impairments in sleep and cognitive function are present. Utilizing joint grant support from the American Rhinologic Society and American Academy of Otolaryngic Allergy, Sinus Center researchers led a team of researchers at three sites across North America to investigate



Density of the olfactory cleft on CT scan assessed by image (left: CRS with anosmia; right: with normal olfaction)

sleep. Utilizing validated patient-reported sleep instruments, researchers found that patients with CRS are much more likely to describe poor sleep quality as compared with matched controls of similar age and gender. Importantly, sleep quality does appear to improve after surgical treatment, although it does not always return to normal levels. This study is currently performing home sleep studies on patients with CRS before and after sinus surgery and comparing objective sleep findings to controls without CRS. The hypothesis is that patients with CRS have impairments in sleep architecture which helps explain fatigue and subjective sleep quality. As Dr. Soler explains, “this study will go a long way in improving our understanding of how CRS impacts sleep function and hopefully will equip us to develop treatment strategies which improve our patient’s ability to sleep soundly.”

At first glance, it might seem odd to study cognitive function in patients with CRS, since most do not overtly seem cognitively impaired. However, many patients will state that they feel they are in a fog, have subtle issues with memory, or simply can’t concentrate. With grant support from the Flight Attendant Medical Research Institute, MUSC Sinus Center researchers have performed computerized cognitive testing on a cohort of patients with CRS, comparing findings to control subjects without CRS. Patients with CRS had subjective cognitive symptoms that were 24-40 percent worse than control patients. Significant declines were seen in tasks related to sustained attention, as CRS patients had simple reaction times that were nearly 20% slower than controls, suggesting that subjective complaints really do stem from underlying deficits. Current research is focusing on whether traditional medical and surgical treatments can improve the cognitive deficits which exist.

## Deciphering mechanisms that contribute to sinonasal inflammation

Sinus Center researchers are also focused on understanding the mechanisms which contribute to sinus disease and using this knowledge to develop novel strategies. The Translational Airway Immunology Laboratory focuses on three primary research areas. The first is to gain a greater understanding of how cells not classically thought of as immune regulatory cells, such as epithelial cells and fibroblasts, regulate the functions of the innate and adaptive immune system, such as Th2 and Th17 cytokine production associated with nasal polyps. Dr. Mulligan explains that the “significance of these cytokines is that they drive many of the physical symptoms of sinusitis including nasal congestion and drainage.” The second area of interest is understanding how dietary and environmental exposures in pregnancy and adolescents can influence respiratory health later in life. The third area of interest is to gain a greater knowledge about the role of vitamin D in upper airway respiratory health. Researchers are heavily focused on examining how impaired local airway synthesis of the active metabolite of vitamin D<sub>3</sub> drives sinonasal inflammation and causes severe sinusitis. All of these projects work together to understand what drives inflammation associated with sinusitis with the goal of developing more targeted therapies to treat this costly and complex disease.



Jennifer Mulligan, Ph.D., runs the MUSC Sinus Center lab

MUSC Sinus Center research is supported by grants from the National Institute of Health, Flight Attendant Medical Research Institute, Kellogg Foundation, American Rhinologic Society, American Society for Pediatric Otolaryngology, American Academy of Otolaryngic Allergy, Denny Hamlin Cystic Fibrosis Research Foundation and the South Carolina Clinical & Translational Research Institute.

## Bringing Complete Cleft Lip and Palate... (continued from page 7)

members as it does on the overseas volunteers. This may be one of the key components as to why the continuity has been so successful. A testament to this effort is seen from the experiences on the Global Smile Ecuador trip. At least four of the local volunteers that are now in their late teens and twenties, were once cleft lip and palate babies treated by the Global Smile Foundation in their infancy. Now, they are volunteers that return every year to translate and many aspire to be medical providers within cleft care themselves.

Much of the week involves orchestrating care of children of all ages. The infants are undergoing cleft lip and palate repairs by a multispecialty surgery team. The speech pathologist work with infants for feeding skills, while also working with the younger children to teach the parents important speech therapy tools to encourage development of proper speech. Surgeons work with the speech pathologist to identify those children in need of speech surgery. Dentists and orthodontists spend a busy week cleaning teeth, filling caries and composing dental plans with the local team to ensure continuity of the care. One major commitment that Global Smile has maintained is that complete cleft care goes beyond repairing the cleft lip and palate. This requires proving the later skeletal and nasal surgeries and mimics the complete care seen within the United States. This can be an enormous challenge with limited operating time and resources, but it promises those families undergoing treatment that Global Smile will be there for them. This promise is what ensures the commitment of continuity from both sides: the families and the medical team.

### Education and Sustainability

Key components to overseas trips are to provide educational opportunities for the medical personnel and families of the countries that allow us to partner. For the medical community, this means lectures, co-operating with local surgeons/residents, and providing educational materials and supplies. For the Global Smile volunteer medical team, this means learning from the local team how they perform many of the same medical needs with less resources. This joint effort unites local and global specialist in a variety of techniques and skills and expands all of our horizons. Of course, it

goes without saying that all overseas medical trips offer unspoken education in understanding of cultures and humanity. It ultimately touches all of us in a way that goes far beyond the medical mission.

Global Smile has also established fellowships for the local surgeons in order for them to be the next leaders of this group locally and continue the care when we are no longer needed. Ultimately when this goal is reached, I know there will always be a bond between us and these global communities.

### MUSC

Global Smile consists of many volunteers from around the world, and has included many MUSC people as well. Melissa Montiel, speech pathology, and I commit to El Salvador annually. David White and I travel to Ecuador. Many of our Otolaryngology residents and fellows have joined us on trips including Lauren Kilpatrick, now a pediatric otolaryngologist at UNC, and a regular team member in El Salvador. Thus, there is a close relationship with this organization and MUSC.

I am also an active member of our MUSC craniofacial cleft lip and palate team. My experiences within this team and my overseas team have helped me grow to provide improved care to both communities. Our department is committed to providing excellence of care to the South Carolina as well as globally.

Outreach trips of all Otolaryngologic needs that our department participate include: Ecuador, Colombia, El Salvador, Dominican Republic, Haiti, Tanzania, Philippines, Mongolia, Bolivia, and Moldova.



# Transient Effectiveness of PD-1 Antibody Treatment for Premalignant Oral Lesions

M. Rita I. Young, Ph.D.

Strategies to inhibit immune checkpoints are now being more commonly used as added treatments for cancer patients, but have not been tested on premalignant lesions that are at high risk of progressing to cancer. Using a carcinogen-induced murine premalignant oral lesion model that progresses to cancer, treatment with antibodies to PD-1 checkpoint increased levels of immune mediators within the oral lesions of the tongue. It also delayed clinical progression of lesions. However, the immune stimulation and clinical stabilization were transient, with both measures reverting to that of control mice. This transient effectiveness was akin to resistance seen to checkpoint blockade in cancer patients, but is the first demonstration of resistance in the premalignant setting. Possible contributors to this resistance are discussed.

## Introduction

Patients with select premalignant oral lesions have a high incidence of developing recurrent premalignant lesions and squamous cell carcinoma of the head and neck (HNSCC). The five year survival of HNSCC patients remains at about 60 percent despite advances in various treatments. Immune therapy is an alternative to surgical treatment, but is discouraged by the profound immune suppression induced by HNSCC. A different strategy is immunotherapy for patients with premalignant oral lesions that are at high risk of developing HNSCC.

Studies with both animal models bearing premalignant

oral lesions and specimens from patients with premalignant oral lesions have shown vibrant immune reactivity within the lesions and adjacent lymph nodes. However, there is also evidence of immunological fatigue and a shift to immune inhibitory processes as evidenced in part by the expression of the programmed death receptor-1 (PD-1).

Strategies to block immune checkpoints such as PD-1 are now being more commonly used as added treatments for cancer patients, with the goal of stimulating anti-tumor immune defenses. However, despite the appearance of PD 1 during development of oral lesions, there have been no studies to determine the role of PD 1 in the shift from the vibrant immune phenotype early in lesion development to the immune depressed state as lesions progress. The present study examined the immunological and clinical impact of treatment with PD-1 blocking antibody in a mouse carcinogen-induced model of premalignant oral lesions.

## Methods and Results

C57BL/6 mice were treated with four nitroquinoline 1-oxide (4NQO) in their drinking water starting at two month of age until development of premalignant oral lesions. In this model, premalignant lesions develop on the tongue and their development was monitored by endoscopically.

Immunological analyses of mice treated with control antibody or PD-1 antibody (Merck) involved measurement of levels of immune cytokines within

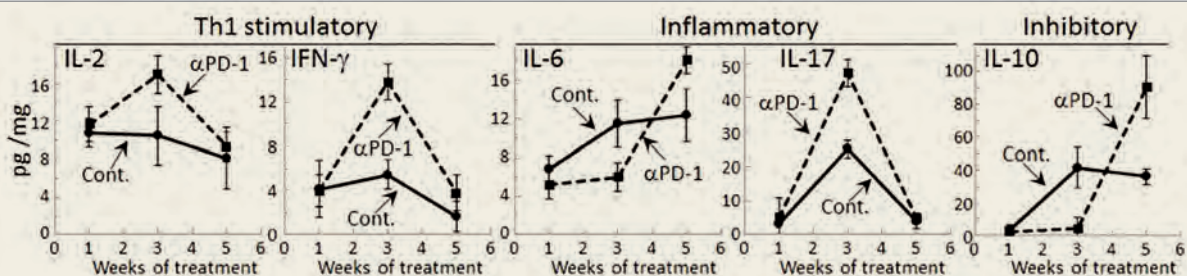


Figure 1. Transient cytokine stimulation in tongue tissue of premalignant oral lesion-bearing mice treated with PD-1 antibody. Mice with 4NQO-induced premalignant oral lesions were sacrificed after 1, 3 and 5 weeks of treatment with isotype control antibodies or PD-1 antibodies ( $\alpha$ PD-1). Levels of cytokines in tongue tissue were compared. Shown are levels of cytokines (mean  $\pm$  SEM). From Levingston & Young, *Cancers*, 9(6). pii: E62, 2017. PMID: 28574425



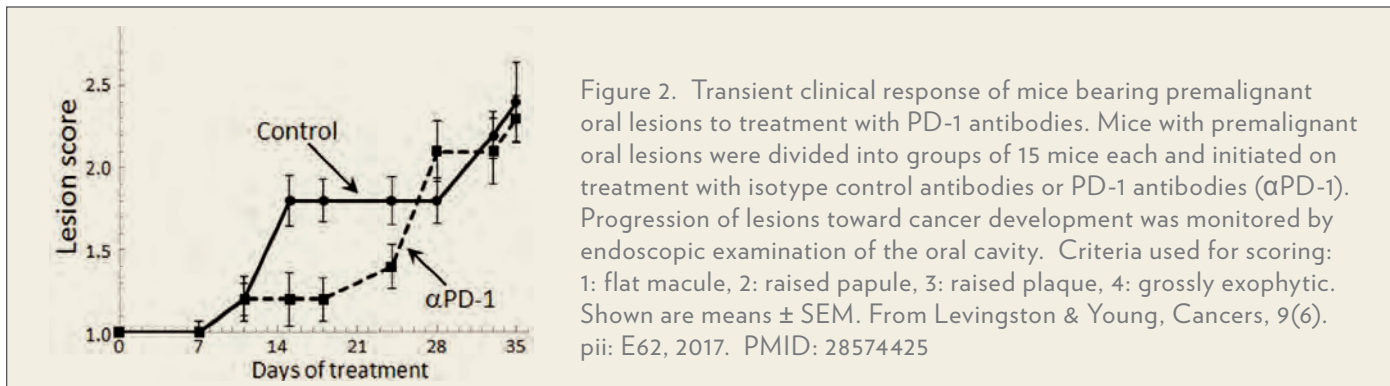


Figure 2. Transient clinical response of mice bearing premalignant oral lesions to treatment with PD-1 antibodies. Mice with premalignant oral lesions were divided into groups of 15 mice each and initiated on treatment with isotype control antibodies or PD-1 antibodies ( $\alpha$ PD-1). Progression of lesions toward cancer development was monitored by endoscopic examination of the oral cavity. Criteria used for scoring: 1: flat macule, 2: raised papule, 3: raised plaque, 4: grossly exophytic. Shown are means  $\pm$  SEM. From Levingston & Young, *Cancers*, 9(6). pii: E62, 2017. PMID: 28574425

lysates of premalignant lesion-containing tongue epithelium. After one week of treatment, the tongue epithelium of both groups of mice contained similar levels of each of the cytokines (**Figure 1**). However, after three weeks of PD-1 antibody treatment, levels of the Th1 stimulatory mediators were increased as were levels of the inflammatory mediator IL-17 over levels in control-treated mice. At 5 weeks of PD-1 antibody treatment, each of these cytokines whose levels were increased at three weeks declined. Levels of the inflammatory mediator IL-6 and the inhibitory mediator IL-10 were reduced in the tongue epithelium of PD-1 antibody-treated mice at three weeks, but there was then a delayed increase at five weeks compared to levels in control mice.

The clinical response to PD 1 antibody treatment was determined endoscopically. The criteria for lesion scoring was: 1: flat macule, 2: raised papule, 3: raised plaque, 4: grossly exophytic.

At two weeks of treatment, the oral lesions of PD-1 antibody-treated mice stabilized, while the lesions of control-treated mice progressed in severity (**Figure 2**). Ten days after the initial lesion stabilization in PD-1 antibody-treated mice, lesions still appeared relatively stable, although there was an increase in lesion severity on some of the mice. However, by four weeks, lesions of PD-1 antibody-treated mice rapidly advanced to similar stages as for control mice and they remained similar until mice were euthanized. Thus, despite early stabilization of disease in PD-1 antibody-treated mice, the lesions subsequently progressed to a similar stage as in controls.

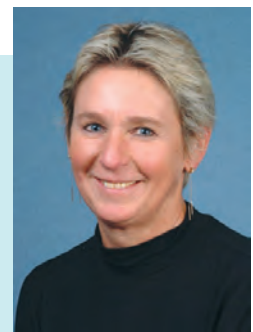
## Discussion

While immunotherapy to interrupt the PD-1/PD-L1 axis has been used for a variety of cancers, it has not been tested as a strategy to prevent progression of

pre-malignant lesions to cancer. The present study demonstrated that PD-1 treatment increased immune activity within the lesion-containing tongue epithelium. However, the increase was transient. Similar to the transiency of the boost in cytokines was the clinical response of mice receiving PD-1 antibody treatment.

The transiency of the immunological boost in the tongue lesion tissue is consistent with demonstrations of acquired resistance to PD-1 antibody treatment in both animal cancer models and in patients. Whether or not the transiency of the PD-1 effectiveness in our premalignant oral lesion model is due to shifts to other immune checkpoints or due to other inhibitory effects has not yet been determined. However, we previously showed an increase in production of the inhibitory mediator PGE2 by premalignant lesion cells at time points similar to the last time point assessed in the present study. Furthermore, this latter study had shown that treatment of lesion-bearing mice with indomethacin to block prostaglandin production increased production immune activity. Thus, it may be that the transient effectiveness of PD-1 antibody treatment could be due to development of prostaglandin-mediated immune inhibition. Additional studies need to be conducted to determine whether blocking PGE2 production could expand the period of effectiveness of PD 1 antibody treatment.

M. Rita I. Young, Ph.D.  
Professor  
Head & Neck Research  
Senior Research Career Scientist  
Ralph H. Johnson VA  
Medical Center



# Neuroimaging Provides Insight for Understanding Age-related Speech Recognition Difficulties

Mark A. Eckert, Ph.D.

Speech recognition in noisy listening conditions is challenging, especially for older adults. Our research focuses on the neurobiologic reasons for why some older adults have impaired speech recognition in noise, while others perform unexpectedly well for their pure tone hearing thresholds. Our long-term goal is to understand how to leverage neural systems that support speech recognition so that we can bootstrap the systems that are declining with age and essential for speech recognition.

Our early work examining speech recognition difficulties in older adults revealed that evidence of structural declines in auditory cortex predicted speech recognition differences between older and younger adults (Harris et al., 2009). This same region of auditory cortex exhibits evidence of decline with hearing loss (Eckert et al., 2012). Thus, some of the speech recognition difficulties that older adults experience could be due to degeneration throughout the auditory system that is reflected in structural declines seen in MRI scans. But, hearing loss is not the only factor contributing to individual variability in auditory cortex morphology. We had also observed that variation in auditory cortex morphology predicted variation in speech recognition across younger adults. The effects of aging and perhaps hearing loss appear to be additive to normal variation in auditory cortex that we and other research groups have found to predict individual variation in language development (Leonard et al., 2006). This could mean that people who have difficulty learning language will

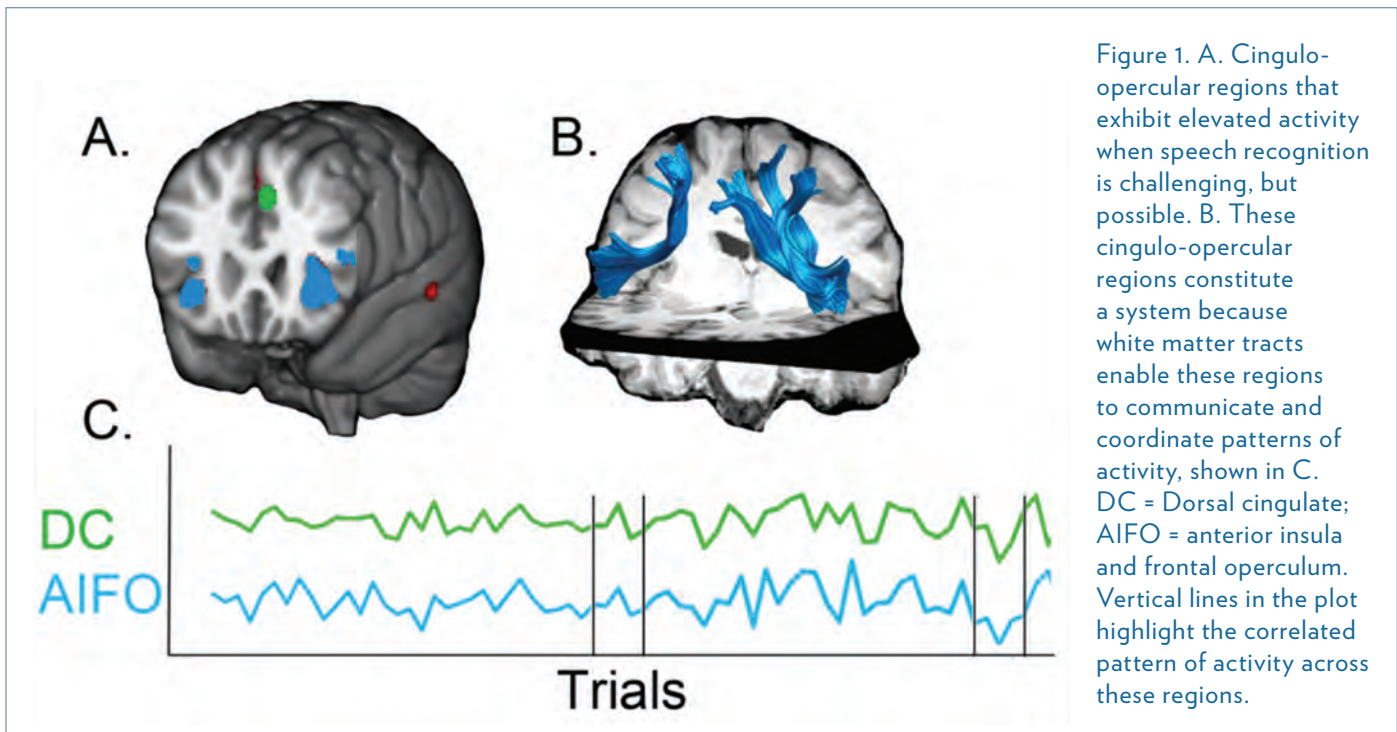
experience the most difficulty recognizing speech when they are older adults.

A consistent finding from our functional MRI studies of speech recognition was that aging effects were not typically in auditory cortex. It appeared that age-related structural declines in auditory cortex led to an increased reliance on frontal cortex during speech recognition in noise, even when younger and older adults were performing at equivalent levels. Age-related increases in frontal cortex activity are commonly observed in studies of age-related changes in perception and memory. These aging effects occur in the same cingulo-opercular cortex that exhibits consistently increased activity when listeners perform speech recognition tasks in more challenging compared to easier listening conditions (Eckert et al., 2016).

**Figure 1** shows the cingulate, anterior insula, and frontal operculum regions that collectively make up the cingulo-opercular performance monitoring system. This system appears to monitor performance during challenging tasks so that behavior can be adapted to optimize performance. A simple example of this system at work is the last time you asked a friend to repeat a sentence because you didn't fully understand what they said. We reasoned that activity in this system should be elevated before someone recognizes speech if it serves to optimize performance. Indeed, we can measure activity in these cingulo-opercular regions ~8 seconds before a word recognition trial and predict the likelihood of whether a listener will recognize a word (Vaden et al., 2013, 2015, 2016). These results



Dr. Mark Eckert's laboratory conducts research focused on understanding the neural basis of individual differences in language and cognitive abilities. In particular, current neuroimaging projects are focused on understanding age-related changes in speech recognition that may stem from changes within the central nervous system, the impact of hearing loss on the central nervous system, and the identification of neural systems that are critical for successful speech training. This research is supported by grants from the NIH/NIDCD, NIH/NCRR, and the Deafness Research Foundation.



indicate that given similar hearing threshold between two listeners, the listener who uses this performance monitoring system more will recognize more words than the other listener.

The cingulo-opercular system is not specifically responsive to speech. This is important because we can look to a broader literature to understand the functional contribution of each component of this system. We have focused our attention on the dorsal cingulate and evidence that it is important for determining the expected value of performing a task. Many years ago, it was not uncommon for patients with mental disorders to receive cingulectomies. These patients often reported increased tiredness and found less value in previously rewarding, but effortful activities, following their surgery. Similarly, animals with cingulate lesions will not work as hard to overcome barriers to reward as they did before the lesion. These findings suggested that our speech recognition results indicate that listeners who find value or importance in understanding speech are more likely to work harder to recognize speech. To test this idea, we developed a measure of cognitive persistence or the ability to overcome task adversity by applying mental effort. We found that listeners who exhibited the most activity in dorsal cingulate cortex during a speech recognition in noise tasks were also more likely to demonstrate the highest cognitive persistence (Teubner-Rhodes et al., 2017). Moreover,

this cognitive persistence measure also predicted speech recognition in noise after adjusting for audibility of the speech. Listeners who exhibited higher cognitive persistence were more likely to exhibit higher speech recognition compared to listeners with equivalent pure tone thresholds who have lower cognitive persistence (Teubner-Rhodes et al., 2017).

We are now asking how and when we can increase activity in the cingulo-opercular system to enhance the communication of older adults and perhaps enhance benefit from interventions. We don't think that increasing cingulo-opercular activity will decrease the perception of listening effort that many older adults report, but we do think that experiencing more value from listening may delay to the onset of listening fatigue. A simple example is how long you would listen to a close friend tell you a funny story compared to listening to an acquaintance talk about the weather in a noisy restaurant. We are also considering how measuring the expected value from listening before hearing aid fitting will help predict who will experience the most hearing aid satisfaction. Thus, our neuroimaging research has helped to identify a neural system that supports speech recognition and is leading us towards behavioral economic research that has the potential to inform clinical decision-making and enhance patient care.

# Clinical Trials Research Program

**Shaun A. Nguyen, M.D., FAPCR**

The MUSC Department of Otolaryngology - Head and Neck Surgery advances the research of pharmaceutical, biological and medical device products by developing collaborations between industry and academia. The Department seeks to provide an efficient integration of academic expertise and industry clinical objectives by offering industry sponsors access to valuable scientific leadership in the areas of clinical trials, evidence-based health care, and analysis of high quality clinical trial data.

The Department is among the top three academic ENT programs in the country for industry-sponsored research, based on funding and number of clinical trials. Current investment in the program is approaching six million dollars due to an emphasis on new devices and pharmaceuticals in addition to traditional surgical interventions.

**Shaun A. Nguyen, M.D., FAPCR**, professor of otolaryngology, leads the ENT Clinical Trials Research Program. Dr. Nguyen was the first physician at MUSC to become a Certified Principal Investigator (CPI) and was one of the first in the country to be inducted as a fellow by the Academy of Physicians in Clinical Research. Major pharmaceutical companies and Clinical Research Offices (CRO's) now encourage CPI certification as it benefits the public, healthcare professionals and the healthcare industry by identifying standards for practice. Dr. Nguyen has been involved in biomedical and clinical research since 2001 and has served as PI and Co-I on more than 200 clinical trials and has authored over 130 peer-reviewed publications.

During any given year, there are 15 to 20 clinical trials of all phases running in the Department. MUSC ENT provides patients in the Charleston area and the state of South Carolina with groundbreaking medical treatment options before the treatments are widely available. "We have world-renowned surgeons participating in the latest clinical trials in chronic sinusitis, Eustachian tube dysfunction, head and neck cancer, hearing loss, Meniere's disease, obstructive sleep apnea, snoring, and tinnitus" says Nguyen. "This gives our patients access to the best expertise and latest treatments."



## Clinical Research Fellowship Program

In addition to a large investment from industry, this flurry of clinical research is helping Nguyen and his colleagues train the next generation of clinical investigators. The Department's three-month research rotation and year-long clinical research fellowship program, one of the nation's first research training programs in otolaryngology, have attracted medical students and physicians from around the world.

The goal of this program is to provide students with the skills required to develop a career in multidisciplinary clinical and translational research relevant to otolaryngology - head and neck surgery. Mentors will create an Individual Development Plan (IDP) for each student, focusing on the six competencies: Scientific Knowledge, Research Skills, Communication, Professionalism, Management and Leadership Skills, Responsible Conduct of Research, and Career Advancement. This fellowship is ideally suited for medical students seeking a research year between the third and fourth years of medical school who are interested in Otolaryngology, and seeking to enhance their existing research skills and experience. There is formal training through lectures and one-on-one mentoring on biostatistics, study design, protocol writing, IRB application, data collection, manuscript writing, and oral/poster presentation. Trainees are expected to present their work at regional and national meetings and publish their findings when appropriate.

As of the 2017-18 academic year, ten classes of research fellows have been selected, totaling more than 50 students. Under the direction of Dr. Nguyen and MUSC ENT faculty, research fellows and residents made an impressive educational footprint at the Fall 2015 AAO-HNSF Annual Meeting with 26 oral presentations.

The MUSC Clinical Research Fellowship Program is endowed by **Drs. Felizardo Camilon and Althea Molarte**, and **Mr. Deming Xiao and Mrs. Julia Chu**.

## CURRENT CLINICAL TRIALS

### Acute Hearing Loss

Efficacy and safety of AM-111 as acute sudden sensorineural hearing loss treatment (ASSENT).

### Eustachian Tube Dysfunction

XprESS Eustachian tube dilation study.

### Meniere's Disease

A phase 1b, randomized, double-blind, placebo-controlled study to evaluate the safety, pharmacokinetics and pharmacodynamics of SPI-1005 in adults with Meniere's disease.

A phase 2B, randomized, double blind, placebo-controlled study to evaluate the safety and efficacy of SPI-1005 in Meniere's disease.

A phase 3 open-label extension safety study of OTO-104 given at three-month intervals for the treatment of Meniere's disease.

### Chronic Sinusitis

A clinical evaluation of the safety and efficacy of the steroid-releasing S8 sinus implant in chronic sinusitis patients with recurrent sinus obstruction.

A phase III, randomized, multicenter, double-blind, placebo-controlled clinical trial of omalizumab in patients with chronic rhinosinusitis with nasal polyps.

A randomized, 24-week treatment, double-blind, placebo-controlled efficacy and safety study of dupilumab 300 mg in patients with bilateral nasal polyposis.

A randomised, double-blind, parallel group phase 3 study to assess the clinical efficacy and safety of SC mepolizumab in maintenance treatment for adults with severe bilateral nasal polyps.

### Sinus Dilation Study

XprESS™ device and PathAssist™ confirmation tools in pediatric patients- expanded indication study.

### Tinnitus

The efficacy and safety of AM-101 in the treatment of acute peripheral tinnitus (TACTT2).

AM-101 in the post-acute treatment of peripheral tinnitus 1 (AMPACT1) – an open-label extension to the TACTT2 study.

### Obstructive Sleep Apnea

Inspire® effects of the Inspire implantable nerve stimulation system on obstructive sleep apnea.

Targeted hypoglossal neurostimulation study #3 (THN3).

Inspire® upper airway stimulation system: post approval study.

Radiofrequency ablation for multi-level obstructive sleep apnea: a single-arm, multicenter study.

### Snoring

Snoring intervention via elevoplasty in a non-surgical clinical environment (S.I.LE.N.C.E.) study.

### Head and Neck Cancer

A phase 1b/2, open-label, multicenter, dose-escalation and expansion trial of intratumoral SD-101 in combination with pembrolizumab in patients with metastatic melanoma or recurrent or metastatic H&N cancer.

A randomized phase II study of adjuvant concurrent radiation and chemotherapy versus radiation alone in resected high-risk malignant salivary gland tumors.

Phase II randomized trial of transoral surgical resection followed by low-dose or standard-dose IMRT in resectable p16+ locally advanced oropharynx cancer.

Phase II trial of nivolumab, an anti-PD-1 monoclonal antibody, as neoadjuvant pre-surgical therapy for locally advanced oral cavity cancer.

### Pediatric Otitis Media and Otitis Externa Studies

An eight-week, prospective, multicenter, open-label study of OTO-201 given to pediatric subjects requiring tympanostomy tube placement.

A one-month, prospective, randomized, double-blind, sham-controlled, multicenter, phase 3 study of OTO-201 given for the treatment of acute otitis externa.

Safety and efficacy of EXE844 otic suspension in the treatment of otitis media at time of tympanostomy tube insertion.

An open-label, single-dose, pharmacokinetic study of EXE844 sterile otic suspension, 0.3% in pediatric subjects following tympanostomy tube surgery.



*On behalf of SPI, I would like to congratulate you and your colleagues at MUSC on the recognition as a top ranked ENT Department by US News and World Reports. We are honored to be collaborating with you and your clinicians, residents, and staff on several studies that are advancing a novel therapy for the prevention and treatment of several neurotologic indications. At SPI we understand how important that is with:*

- 4 investigational new drug applications with the FDA
- 3 completed clinical trials and 2 ongoing clinical trials in Ototoxicity and Meniere's disease
- Phase 2 safety and efficacy of SPI-1005 in preventing noise induced hearing loss was recently published in *The Lancet*
- Several active collaborations with leading U.S. academic centers
- Strong history of collaborative funding from DoD and private foundations

*Jonathan Kil, M.D., Co-Founder, CEO and CMO*

## Farewell Residents & Fellows



### 2017 Resident Graduates

(center) Drs. Travis Schrank, Valerie Fritsch, and William Carroll, with spouses (l-r) Yani Schrank and Kiften Carroll.



**D**r. William W. Carroll matched into the Pediatric Otolaryngology Fellowship position at the University of Minnesota, following in the footsteps of Drs. Chris Discolo and Travis Reeves. Dr. Carroll was known for his leadership, scholarship, and his ability to kick a soccer ball farther than any Otolaryngology resident in recent memory. He published eight papers on a wide variety of Otolaryngology topics, and remained a strong supporter of the Davidson Wildcats and of course the Golden State Warriors. We wish Dr. Carroll all the best, and hope he remains warm in Minnesota this year.

**Dr. Valerie Fritsch** leaves MUSC to join the South Carolina ENT practice in Columbia, South Carolina as a general otolaryngologist. Dr. Fritsch has been and continues to be a multitasker extraordinaire as in addition to starting a practice, she is pursuing an MBA from Auburn University. During residency, Dr. Fritsch won several commendations for patient care, and she was known for her kind demeanor and patience in teaching junior residents. She published ten papers as a resident with Dr. Lentsch on outcomes for patients with head and neck cancer, presented results at numerous national and international meetings, and ran several marathons – including one in Vancouver at the AAOHNS meeting. Not a bad days work.

**Dr. Travis Schrank** matched into the Head and Neck Oncologic and Reconstructive Surgery Fellowship at the University of North Carolina. Dr. Schrank was known for his work ethic, teaching, and dry wit during residency. He brought a strong academic background with him to residency with several publications on protein confirmation during Ph.D. graduate school. Dr. Schrank was able to continue at least a portion of this basic science work during residency and added clinical research to his impressive resume as well,

graduating with ten manuscripts. An avid outdoorsman, you are likely to find Dr. Schrank mountain climbing when he is not taking care of his patients. This was truly an outstanding group, they will be missed

Once again, we had a wonderful year with all of our fellows and wish them well as they move across the country to start their careers. **Dr. Sharon Gnagi** completed a fellowship in Pediatric Otolaryngology and has joined Phoenix Children's Hospital where she is starting a tertiary clinical practice covering complex airway, craniofacial, and pediatric otologic cases. She trains residents from the Mayo otolaryngology program in Scottsdale, AZ.

**Drs. Suheal Momin and Evan Graboyes** completed an intensive fellowship in Head and Neck Surgery and Microvascular Reconstruction. Suheal is currently an Assistant Professor at Henry Ford Hospital in Detroit, MI, focusing on head and neck surgical oncology and microvascular reconstruction. Evan joined the MUSC faculty as a surgeon-scientist. His clinical practice combines head and neck surgical oncology with microvascular reconstruction. Dr. Graboyes' research addresses clinical problems related to gaps in the quality of head and neck cancer care and improving the patient-centeredness of cancer care delivery.

Lastly, **Dr. Jose Mattos** completed a Rhinology fellowship and has joined the faculty at the University of Virginia as a surgeon-scientist with interests in quality improvement, taste, and outcomes research.

# Welcome to MUSC!

## PGY2 Residents

The MUSC Department of Otolaryngology-Head & Neck Surgery welcomed four new PGY2s into service in July 2017.



**Jordan J. Allensworth, M.D.**, from Springfield, Oregon, earned his BS in Biology from The University of Portland in Oregon. He completed and published research in basic immunology before attending medical school at Oregon Health & Science University in Portland, where he was inducted into the Alpha Omega Alpha Honor Medical Society. He has authored publications on the innate immune system, aminoglycoside ototoxicity during sepsis, and reconstructive surgery after acute invasive fungal sinusitis, among other topics. In his free time, Jordan enjoys hiking, running, film photography and spending time with his fiancé.



**Mark S. Costello, M.D.**, from Huron, Ohio, earned his BS in Biology from Xavier University in Cincinnati, and subsequently attended the University of Cincinnati College of Medicine, where he was inducted into the Alpha Omega Alpha and Gold Humanism honor societies. While in medical school, he co-authored multiple publications in the fields of Allergy and Immunology, Neurosurgery, and Otolaryngology. While not at work, Mark enjoys spending time with his wife, Julie, and their two dogs, golfing, running, lifting weights, reading, and playing chess.



**Mark A. Ellis, M.D.** is from Lookout Mountain, Tennessee. He received his BA in Economics from the University of Georgia. Mark attended the Medical College of Georgia where he was president of the Alpha Omega Alpha Honor society. He has co-authored several publications regarding head and neck oncologic outcomes. In his free time, Mark enjoys spending time with his wife, running, fly-fishing and cooking.



**Joshua D. Horton, M.D.** born and raised in southwestern Indiana, received his BS in biochemistry from Indiana University – Purdue University Indianapolis, summa cum laude. He then attended New York University School of Medicine in Manhattan where he learned medicine at the storied Bellevue Hospital. While there, he participated in both basic and clinical science research in several fields prior to discovering ENT, including HIV, hematology/oncology, and vascular surgery (which culminated in a publication on aortic dissection in JAMA). Other than work, Josh enjoys spending time with friends, fly fishing, golf, cornhole, breweries, non-fiction books, and watching sports – especially Hoosier basketball.

## 2017-18 Fellows

MUSC offers otolaryngology fellowships in Head & Neck Oncologic and Reconstructive Surgery, Rhinology and Endoscopic Sinus/Skull Base Surgery, Pediatric Otolaryngology, and Neurotology. In addition to an extensive surgical experience, fellows benefit from a multidisciplinary approach by participating in outpatient clinics, rounds, and didactic conferences.



**William Greer Albergotti, M.D.**  
**Head & Neck Oncology Fellow**  
 MD: Medical University of South Carolina  
 Residency: University of Pittsburgh Medical Center  
 Special Interests: Outcomes Research – both oncologic and quality of life.



**Robert Michael Brody, M.D.**  
**Head & Neck Oncology Fellow**  
 MD: Jefferson Medical College, Philadelphia, PA  
 Residency: University of Pennsylvania Health System  
 Special Interests: The multidisciplinary care of head and neck cancer patients.



**Jonathan L. Hatch, M.D.**  
**Otology / Neurotology Fellow**  
 M.D.: Creighton University School of Medicine  
 Residency: University of Nebraska Medical Center  
 Special Interests: Adult and pediatric hearing loss, cochlear implants, skull base surgery



**Alexander Phillip Marston, M.D.**  
**Pediatric Otolaryngology Fellow**  
 M.D.: University of Minnesota, Minneapolis,  
 Residency: Mayo Clinic, Rochester, MN  
 Special Interest: Pediatric otolaryngology, head and neck masses, vascular malformations, cleft lip and palate, congenital and acquired hearing loss



**Nicholas R. Rowan, M.D.**  
**Rhinology Fellow**  
 M.D.: Rutgers: New Jersey Medical School  
 Residency: University of Pittsburgh Medical Center  
 Special Interest: Rhinology and endoscopic skull base surgery, sinonasal microbiome, advanced skull base pathology and outcomes research

# Otolaryngology - Head & Neck Surgery Faculty

## Otology & Neurotology



**Paul R. Lambert, M.D.**  
Professor and Chairman  
Director, Otology-Neurotology  
M.D.: Duke University  
Residency: UCLA  
Fellowship: House Ear Institute, Los Angeles



**Theodore R. McRackan, M.D.**  
Assistant Professor  
Director, Skull Base Surgery Center  
M.D.: MUSC  
Residency: Vanderbilt University Medical Center  
Fellowship: House Ear Clinic



**Ted A. Meyer, M.D., Ph.D.**  
Associate Professor  
Director, Cochlear Implant Program  
M.D. & Ph.D.: University of Illinois  
Residency: Indiana University  
Fellowship: University of Iowa



**Habib G. Rizk, M.D., MSc**  
Assistant Professor  
Director, Vestibular Program  
M.D.: Saint Joseph University, Beirut, Lebanon  
Residency: Saint Joseph University and Hotel-Dieu de France Hospital, Beirut, Lebanon  
Fellowship: MUSC



**Mary Ann Howerton, PA-C**  
Physician Assistant  
MSPAS: MUSC

## Rhinology & Sinus Surgery



**Rodney J. Schlosser, M.D.**  
Professor  
Director, Nose and Sinus Surgery  
M.D.: Mayo Clinic  
Residency: University of Virginia  
Fellowship: University of Pennsylvania



**Zachary M. Soler, M.D., M.Sc.**  
Associate Professor  
M.D.: Wake Forest University  
Residency: Oregon Health and Science University  
Fellowship: Harvard Medical School

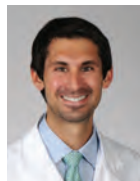


**Mary Reames Rinehart, MSN, FNP-C**  
Family Nurse Practitioner  
MSN: MUSC

## Head & Neck Oncology



**Terry A. Day, M.D.**  
Professor and Director  
MUSC HN Tumor Program  
Wendy and Keith Wellin Chair in Head & Neck Surgery  
M.D.: University of Oklahoma  
Residency: LSU-Shreveport  
Fellowship: UC Davis



**Evan M. Graboyes, M.D.**  
Assistant Professor  
M.D. & Residency: Washington University in St. Louis School of Medicine  
Fellowship: MUSC



**Joshua D. Hornig, M.D., FRCS(C)**  
Associate Professor  
Director, Microvascular Surgery and Functional Outcomes  
M.D. & Residency: Univ. of Alberta  
Fellowship: MUSC



**Eric J. Lentsch, M.D., FACS**  
Professor  
M.D. & Residency: University of Louisville  
Fellowship: MD Anderson



**David M. Neskey, M.D., FACS**  
Assistant Professor  
M.D.: Albany Medical College  
Residency: University of Miami  
Fellowship: MD Anderson



**Roy B. Sessions, M.D.**  
Professor  
M.D.: Louisiana State University, New Orleans  
Residency: Washington University School of Medicine, St. Louis



**Mary Beth Chalk, MSN, NP-C**  
Family Nurse Practitioner  
MSN: MUSC



**Cheryl A. Jones, DNP, NP-C**  
Family Nurse Practitioner  
DNP: MUSC



**Caitlin L. Mengler, RN, ACNP-BC**  
Acute Care Nurse Practitioner  
MS: New York University

## Head & Neck Oncology



**TK Wall, DNP, NP-C**  
Family Nurse Practitioner  
DNP: MUSC

## Evelyn Trammell Institute for Voice and Swallowing



**Lucinda A. Halstead, M.D.**  
Associate Professor  
Medical Director, ETIVS  
M.D.: George Washington University  
Residency: New England Medical Center, Boston



**Ashli K. O'Rourke, M.D.**  
Associate Professor  
M.D.: Medical College of Georgia  
Residency: University of Virginia  
Fellowship: Medical College of Georgia

## Pediatric Otolaryngology



**David R. White, M.D.**  
Professor and Director,  
Pediatric Otolaryngology  
MUSC Children's Health Surgeon in Chief  
Director, Airway and Aspiration Center for Children  
M.D.: MUSC  
Residency: UNC Chapel Hill  
Fellowship: Cincinnati Children's Hospital



**Clarice S. Clemmens, M.D.**  
Assistant Professor  
M.D.: MUSC  
Residency: Hospital of the University of Pennsylvania  
Fellowship: Children's Hospital of Philadelphia



**Christopher M. Discolo, M.D., MSCR**  
Assistant Professor  
Director, Craniofacial Anomalies and Cleft Lip/Palate Team  
M.D.: State University of New York Health Science Center at Brooklyn  
Residency: Cleveland Clinic  
Fellowship: University of Minnesota / Pediatric ENT Associates



**Carissa C. Howle, CPNP**  
Pediatric Nurse Practitioner  
MSN: MUSC



## Facial Plastic & Reconstructive Surgery



**Krishna G. Patel, M.D., Ph.D.**  
Associate Professor  
Director, FPRS  
M.D. & Ph.D.: Medical College of Georgia  
Residency: UNC Chapel Hill  
Fellowship: UC Davis



**Samuel L. Oyer, M.D.**  
Assistant Professor  
M.D.: Indiana University  
Residency: MUSC  
Fellowship: Johns Hopkins Hospital



**Judith M. Skoner, M.D.**  
Assistant Professor  
M.D.: University of South Carolina  
Residency: MUSC  
Fellowship: Oregon Health and Science University

## Maxillofacial Prosthodontics



**Betsy K. Davis, D.M.D., MS**  
Professor  
Medical Director, Maxillofacial Prosthodontics  
D.M.D.: MUSC  
Residency: University of Iowa  
Fellowship: M.D. Anderson; UCLA



**J Rhet Tucker, D.M.D.**  
Assistant Professor  
D.M.D.: University of Pennsylvania  
Residency: U.S. Army  
Fellowship: MD Anderson

## General Otolaryngology & Allergy



**Mark J. Hoy, M.D.**  
Assistant Professor  
Director, General Otolaryngology & Allergy  
M.D.: Temple University  
Residency: University of Louisville



**Robert C. Waters, M.D.**  
Clinical Assistant Professor  
M.D.: MUSC  
Residency: Washington University in St. Louis



**Claire O'Bryan, ANP-C**  
Nurse Practitioner  
MSN: MUSC

## Audiology



**Kimberly A. Orr, Au.D., CCC-A**  
Director, Audiology  
M.A.: Ohio State University  
Au.D.: A.T. Still University



**Elizabeth Camposeo, Au.D., CCC-A**  
Instructor  
Au.D.: Northwestern University



**Laura A. Droege, Au.D., CCC-A**  
Instructor  
M.A.: Northern Illinois University  
Au.D.: A.T. Still University



**Meredith A. Holcomb, Au.D., CCC-A**  
Clinical Assistant Professor  
Clinical Director, Cochlear Implant Program  
Au.D.: UNC Chapel Hill



**Cortney J. Hudak, Au.D., CCC-A**  
Instructor  
Au.D.: University of Akron/Kent State University



**Elizabeth A. Poth, Au.D., CCC-A**  
Instructor  
M.S.: UNC Chapel Hill  
Au.D.: A.T. Still University



**Michelle L. Reiter, Au.D., CCC-A**  
Instructor  
Au.D.: UNC Chapel Hill



**Christine C. Strange, Au.D., CCC-A**  
Instructor  
Clinical Director, Vestibular Program  
M.A.: SUNY Plattsburgh  
Au.D.: A.T. Still University



**Yolyn Sung, Au.D., CCC-A**  
Instructor  
Au.D.: Vanderbilt University

## Research



**Judy R. Dubno, Ph.D.**  
Professor, Director, MUSC Hearing Research Program  
Ph.D.: City University of New York



**Jayne B. Ahlstrom, M.S.**  
Instructor  
MUSC Hearing Research Program  
M.S.: Vanderbilt University



**Mark A. Eckert, Ph.D.**  
Professor  
MUSC Hearing Research Program  
Ph.D.: University of Florida



**Kelly C. Harris, Ph.D.**  
Associate Professor  
MUSC Hearing Research Program  
Ph.D.: University at Buffalo



**Lois J. Matthews, M.S.**  
Instructor  
MUSC Hearing Research Program  
M.S.: Purdue University



**Kenneth I. Vaden, Jr., Ph.D.**  
Research Assistant Professor  
MUSC Hearing Research Program  
Ph.D.: University of California, Irvine



**Jennifer K. Mulligan, Ph.D.**  
Assistant Professor  
Rhinology & Sinus Surgery  
Ph.D.: MUSC



**Shaun A. Nguyen, M.D., FAPCR**  
Professor  
Director, Clinical Research  
M.D. & Residency: University College London  
Fellowship: MUSC



**M. Rita I. Young, Ph.D.**  
Professor  
Head and Neck Research  
Senior Research Career Scientist,  
Ralph H. Johnson VA Medical Center

# Upcoming CME Events

## 32nd Annual F. Johnson Putney Lectureship in Head & Neck Cancer

December 8, 2017 Hollings Cancer Center, MUSC Campus  
This half day lectureship will bring together world class Head & Neck specialists to discuss improving the quality of health care for patients with head and neck cancer and a forward-looking vision of surgery in 2020.

F. Johnson Putney Lecturer in Head & Neck Cancer:

**Jonathan M. Irish, M.D., MSc, FRCSC, FACS**, Cancer Care Ontario, Toronto, Canada

## The Charleston Pediatric ENT Update

February 10, 2018 Courtyard Charleston Historic District  
A comprehensive full day course designed to provide pediatricians, family practitioners, and otolaryngologists with up-to-date guidelines to implement in their daily practice, promote quality and efficient care, and tackle challenging ENT diagnosis with confidence.

Keynote Speaker:

**Lee P. Smith, M.D.**, Children's Medical Center of New York

## The ABCs of Maxillofacial Prosthodontics Medical & Dental Billing

March 2, 2018 Courtyard Charleston Historic District  
This one day course is designed for dentists, prosthodontists, and maxillofacial prosthodontists. Topics will include: precertification, financial counseling, coding, reimbursement, compliance, managed care, billing, dictation templates, facility/supply billing, and integration of maxillofacial prosthodontic billing into the hospital system.

## The 6th Pediatric Audiology Conference: Improving Spoken Language Outcomes for Children with Hearing Loss

March 23, 2018 Courtyard Marriott Mount Pleasant  
This is a one-day conference designed for all providers (audiologists, speech pathologists, teachers of the deaf, early interventionists, hearing aid specialists, physicians, NPs, PAs, etc.) involved in the care of hearing impaired children. The course will cover many key topics in the management of children with hearing loss.

Keynote Speakers:

**Amy McConkey Robbins, MS, CCC-SLP, LSLS Cert. AVT**, Communication Consulting Services  
**Kathryn Wilson, MA, CCC-SLP, LSLS Cert. AVT**, Hearing First

## The 17th Temporal Bone Dissection Course

April 2018 MUSC Campus

This intensive two-day otology course offers lectures and hands on labs focused on procedures for chronic ear disease. For practicing otolaryngologists.

Keynote Speaker: **Nikolas Blevins, M.D.**, Stanford Health Care

## Southern States Rhinology Course

May 3 - 5, 2018 Kiawah Island and MUSC Campus

This course is intended for practicing Otolaryngologists and will feature presentations on topics for the practicing rhinologists and sinus surgeons. A hands-on laboratory dissection is available, featuring state-of-the-art endoscopic instrumentation, video, and image guidance systems.

## 18th Annual Charleston Magnolia Conference

June 1 - 2, 2018 Hyatt House Charleston Historic District

Two half-day sessions covering the broad spectrum of Otolaryngology – Head and Neck Surgery. The lectures and round table discussions are specifically aimed at the practicing otolaryngologist. There will be ample opportunity for questions, comments, and presentation of cases by the audience. Our goal will be to review and to provide the latest information on a broad range of topics, so that optimal diagnostic and management strategies can be formulated.

Keynote Speakers:

**John Dornhoffer, M.D.**, University of Arkansas for Medical Sciences, Little Rock, AR

**Gaelyn Garrett, M.D.**, Vanderbilt University Medical Center, Nashville, TN

**Andrew Murr, M.D.**, UCSF School of Medicine, San Francisco, CA

## The Charleston Course, 8th Annual Otolaryngology Literature Update

July 13 - 15, 2018 Kiawah Island Golf Resort

In three days, more than 100 manuscripts will be reviewed, and those “pearls” important to your practice will be emphasized. I believe that there may be no better way to stay current in our field than with this Literature Update Course.

**For course registration or more information:**

Julie Taylor, [taylorjul@musc.edu](mailto:taylorjul@musc.edu) or 843-876-0943

Check our website for updates: [musc.edu/ent/cme](http://musc.edu/ent/cme)



## Ranked #11 in the Country

The MUSC Department of Otolaryngology - Head & Neck Surgery continues to rank among the elite programs in the country in education, clinical research and clinical trials, basic research, and patient care. “We take enormous pride in this special Department, but acknowledge that our Department does not function in isolation, and thus we applaud the leadership and infrastructure provided by MUSC and our amazing colleagues across the enterprise.”

Paul R. Lambert, M.D.  
Professor and Chair  
Department of Otolaryngology - Head & Neck Surgery  
Director, Otology & Neurotology



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## THE MEDICAL UNIVERSITY OF SOUTH CAROLINA

Founded in 1824 in Charleston, The Medical University of South Carolina is the oldest medical school in the South. Today, MUSC continues the tradition of excellence in education, research, and patient care. MUSC educates and trains more than 3,000 students and residents, and has nearly 13,000 employees, including approximately 1,500 faculty members. As the largest non-federal employer in Charleston, the university and its affiliates have collective annual budgets in excess of \$2.2 billion. MUSC operates a 750-bed medical center, which includes a nationally recognized Children's Hospital, the Ashley River Tower (cardiovascular, digestive disease, and surgical oncology), Hollings Cancer Center (one of 68 National Cancer Institute designated centers), Level I Trauma Center and Institute of Psychiatry.

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