


AARC  
An Official Publication of the American Association for Respiratory Care  
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# Times



Timothy Myers  
Receives Jimmy  
A. Young Medal

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References: 1. Dugernier J et al. SPECT-CT Comparison of Lung Deposition using a System combining a Vibrating-Mesh Nebulizer with a Valved Holding Chamber and a Conventional Jet Nebulizer; a Randomized Cross-over Study, *Pharmaceutical Research*. 2017;34:290-300. 2. Chweich H et al. Effect on Airflow of Bronchodilator Therapy Delivered via Vibrating-Mesh versus Jet Nebulizers in Acute Asthmatics in an Emergency Department. Poster at ATS, 2019; 3. Dunne RB and Shortt S. Comparison of bronchodilator administration with vibrating-mesh nebulizer and standard jet nebulizer in the emergency department. *The American Journal of Emergency Medicine*. 2018;36(4):641-646.

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## AARC Strategic Plan

The American Association for Respiratory Care has a Strategic Plan that includes its Mission and Vision Statements for 2015–2020.

Bookmark this page:

<http://www.aarc.org/aarc/mission-statement/>



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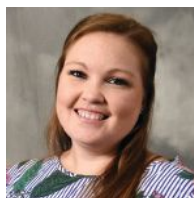
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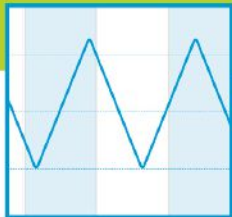
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1. Milla CE, Hansen LG, Weber A, Warwick WJ. High frequency chest compression: effect of the third generation waveform. Biomed Instrum Technol 2004; 38:322-328. Note: 8 CF comparing triangular waveform vs. sine waveform technology.

2. Milla CE, Hansen LG, Warwick WJ. Different frequencies should be prescribed different high frequency chest compression machines. Biomed Instrum Technol 2006;40:319-324. Note: 100 CF patient study comparing triangular vs. sine waveform technology.

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## Brother, Can You Take a Punch?

by Anthony L. DeWitt, JD, RRT, FAARC

**H**ead injuries, psychotropic drugs, ETOH, PCP, LSD, and any combination of these can cause patients to become combative and make it impossible to treat them for injuries sustained in either accidents or altercations with police. Most states have laws on the books that protect caregivers' action in the event of a violent attack by patients. The problem with law books is that people on PCP and other substances won't read them.

One of my most entertaining experiences as a therapist occurred in the emergency department. A bus transporting the baseball team from a Catholic university overturned, and several boys were brought into the ER with suspected head injuries. Once alerted to the accident, the mother of one of the boys came to the ER to find her son. He was sitting up with an ice bag on a knot on his head, and she went to hug him. Out of his mouth came a stream of expletives that would have made a profanity coach green with envy. The boy's mother asked, "Don't you know who I am?" He responded that he did, and again he let loose with a string of intense insults. A nurse took mom out of the room, and a doctor explained that sometimes, with concussions, people had personality changes.

I was asked to transport the patient to the operating room. He required a surgical fracture fixation, and his right cross very nearly connected with my nose. (I have since learned from my six-year-old grandson, who is a black belt in tae kwon do, that you should never "block with your face.") The transport was a festival of duck and cover, and in spite of my best efforts to avoid him, he still landed several good clean blows on me. Many of us are conditioned in childhood to hit back, but that's unethical for health care practitioners. This patient's behavior was not violence, but a symptom of a medical condition and must be managed in this manner.

After that event, I held a short in-service for the staff on what to do if a patient became physically violent. My first instruction was "never hit back." That is the only ethical approach. That does not mean you cannot defend yourself by blocking attempts to hit you, but it does mean you cannot strike the patient, only hold them. I developed seven principles that, when properly used, can prevent work-related violence in patient care. I call these principles the "Seven Ds."

**Document:** Documenting a patient's known violent tendencies in the medical record is essential to put staff on notice and to help ensure another caregiver's safety. Do not rely on the medical record, however. Pass the information to those caring for the patient in shift report. Be careful, however, not to post information where a family member or relative may see it. This information is best communicated one-on-one.

**Double Up:** If you suspect a patient may be violent toward you or someone else, always approach that patient with sufficient staff to handle the problem. Many times, a patient will not assault someone when multiple caregivers are in the room, instead waiting until a caregiver is alone. If you prevent that scenario, you may not have to take any further steps to guarantee your safety.

**Distance:** Distance is your friend in an encounter with a violent patient, no matter the cause. Move away from them, put something big and heavy between you and them (an empty bed, a door, etc.). If they can't see you or reach you, they cannot hit you. Once you have distance, call for help. Do not try to deal with a patient alone. In that situation, it is your word against the patient's. More help means more witnesses and more documentation.

### about the author...



Anthony L. DeWitt, JD, RRT, FAARC, is an attorney and a partner in the firm Bartimus, Frickleton, and Robertson, PC, and resides in Opelika, AL. He has also published two books and numerous legal journal articles. This article is not a substitute for legal advice.

**Disengage:** A patient may suddenly and unexpectedly grab you by the arm or wrist and try to pull you closer. Many people make the mistake of pulling against the strongest muscles in the patient's hand, those in the fingers. If grabbed, pull back against the thumb. In most cases the thumb is the weakest point of the hand, and you can get away if you pull down and against the thumb. A number of videos demonstrate releases like this, but be careful. Some demonstrate techniques that cause harm to the person grabbing you. You want to avoid that if at all possible.

**Deflect:** If an attacker starts slapping or punching you instead of grabbing you, the easiest thing to do is cover your head and face and back away as far away as possible. This allows you to deflect the blows and ensure you don't get knocked unconscious.

**Don't Be Silent:** Yell for help! Hospital security and other caregivers can be of assistance in these situations. Never try to go it alone.

**Don't Interfere:** Should a patient become so violent that police are called, let them handle it and do not interfere. Even if a police officer uses a taser or another device that

you believe they shouldn't be using, do not interfere with a police officer discharging their lawful duties. Doing so could get you criminally charged, even if you had nothing but the highest ethical principles in mind.

What happens if you are surprised and you reflexively punch a patient in self-defense? In most cases, very little will happen if it truly is reflexive and it happens in the first second or so of the encounter. However, if you hit back after taking three or four blows, you may be committing an ethical violation. The first rule of medicine is to do no harm, and even if you're being assaulted, you have an ethical duty to ensure your patient's safety.

For additional information, see *The Assessment and Management of the Violent Patient in Critical Hospital Settings*, found online at <https://www.health.state.mn.us/facilities/patientsafety/preventionofviolence/docs/assess-manageviolentpatientarticle.pdf>.

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## From the President's Desk

# The “Why” Matters

by Karen Schell, DHSc, RRT, RRT-NPS, RRT-SDS, RPFT, RPSGT, AE-C, CTTS, 2019–2020 AARC President

**B**uilding relationships matters. Taking time to connect, communicate, and care builds relationships. Who we love and how we care for them can make a difference in our lives. Human beings are interconnected, and our decisions not only affect ourselves but others. We make decisions out of love, empathy, and sensitivity to a situation. We rely on a blending of reason, emotion, and action. We decide to set the example and focus on being the best every day. People feel personally cared for and connected by collaboration and communication.

Changes are occurring, and RTs need to be forward thinking and plan for the change. Change is possible for the good, and we can be proactive in creating the change we need. We must keep moving the profession forward. We need to visualize the future and evolve to adapt to the changes that are needed. RTs need to be engaged and understand what the future holds for the profession. We need to be prepared.

The profession needs to evolve with the changing times. Dr. Henry Link said, “We generate fears while we sit. We overcome them by action.” It is time for action, it is time to grow to meet the future. We need everyone’s help to lay the foundation for the work ahead.

The AARC Board of Directors (BOD) and the House of Delegates (HOD) met this past July after the Summer Forum in Fort Lauderdale. We are working to build relationships with members, stakeholders, colleagues, and patients. We need to raise the standard,

set the example, and focus on our growth into the future. The AARC BOD and HOD had a productive meeting, discussing, planning, and developing strategies to address the six Horizon Goals approved this last year. We worked together to lay the foundation

from moving the profession forward to meeting the challenges ahead. We must push, challenge, and stretch each other to be our best. We are open to your feedback and suggestions as we strive to learn, improve, and position us better for the future.

We have a common purpose: it is all about the “why” — our patients. It is time to create opportunities, come up with potential interventions to achieve desired outcomes, and accept responsibility for our future. We are working on developing realistic strategies to meet our goals and move toward them together.

Committees, special representatives, stakeholders, members, and patients all need to be part of the movement ahead. The AARC BOD and executive office are committed to Horizon Goal #2, and the AARC consistently delivers the right message, to the right audience, at the right time, and through the right

channel. Here is a quick overview of the work being done since the last meeting. We welcome your feedback, questions, clarification, or concerns. Please feel free to contact us as we roll out initiatives over the next few months.

The six Horizon Goals can be found at [www.aarc.org](http://www.aarc.org).

### about the author...



Karen Schell, DHSc, RRT, RRT-NPS, RRT-SDS, RPFT, RPSGT, AE-C, CTTS is an assistant clinical professor in the respiratory care department at the University of Kansas Medical Center School of Health Professions in Kansas City, KS, and president of the AARC.

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### **Goal # 1 – Advocacy**

- The Breathe Act (HR 2508) was introduced in early May and has 37 co-sponsors. PACT day was a success with a record number of emails sent to the Hill prior to the PACT members visiting their state representatives. Visit [www.congress.gov](http://www.congress.gov) for the most current update.
- AARC has been contacting many offices on Capitol Hill to address the CMS addition of noninvasive ventilators to the competitive bidding process.
- AARC signed a brief with key public health organizations to have the FDA conduct a product review of e-cigarette and vaping products.

### **Goal #2 – Communication/marketing**

- The AARC President, BOD members and Executive Office staff presented at state meetings encouraging “grass root” support and updating membership on issues important to the profession.
- BOD is working with the AARC Executive Office to develop marketing tools promoting the Respiratory Therapist and encouraging student enrollment
- The AARC is committed to working with stakeholder organizations to share information affecting the health of our patients, such as allergy issues on flights, smoking/vaping, etc.
- Life and breath video to be rebooted – “Be an RT” – and will be ready by the 2019 AARC Congress.
- The AARC intends to support the Safety Awareness March next year in Washington D.C. to bring attention to the deaths by medical errors.

### **Goal #3 – Education/professional development**

- AS to BS conversion committee appointed to assist in moving the profession to a BS degree.
- The AARC BOD continues to work with the Position Statement Committee in developing an Issue Paper - Entry Into Respiratory Practice 2030.
- Program committee developed Summer Forum and AARC Congress programs.
- Career pathway presentation for educators to promote entry to practice, updated Bureau of Labor and Statistics for accuracy, created video testimonials for different pathways to complete BS.
- Vision Grant – nine requests received.

### **Goal #4 – Events/meetings**

- Attendance reached an all-time high at Congress and Summer Forum.
- International community to promote the practice of respiratory care globally through International Education Recognition System (IERS) accredited programs.

### **Future meetings:**

- AARC Congress – 2019 – New Orleans, LA
- Summer Forum 2020 – Snowbird, UT
- AARC Congress – 2020 - Orlando, FL
- Summer Forum 2021 – Bonita Springs, FL
- AARC Congress – 2021 – Phoenix, AZ

### **Goal # 5 – Membership**

- Membership is static – AARC is working on initiatives to recruit and retain members members through various committees.
- Involving sections to work on increasing membership.

### **Goal #6 – Revenue and Finance**

- Quarterly review conducted by the BOD
- Annual audit concluded
- Yearly report on investment finalized
- Accounting software upgrade completed
- The AARC continues to operate within budget and maintains exceptional fiduciary responsibility with the organization's finances.

I encourage you to think about how you can make the best of this moment at home. What do you have to share? Are your actions positive, inclusive, and caring? Can you be inspired to make a change that impacts the profession daily? You can make a difference. Become involved, and inspire others to be involved. We need a community of RTs who are caring, committed, and collaborating to move towards our goals. I am challenging you to grow, to change, to be all you can be, and to inspire others to do the same. Nothing you do is insignificant; every act shapes the world for better or worse, and you are responsible for whatever you do or don't do. You have the power to touch others in a deep and meaningful way, so believe in your abundance and contribute whatever you can, whenever possible. Our profession and our patients are counting on you. It is all about the “WHY.”

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## AARC Times Rewind

# In the Public Eye

by Debbie Bunch

**D**octors and nurses dominate the public eye when it comes to health care, and it's easy to understand why. There are lots of them, and their professions have been around in some form or fashion for thousands of years. But that doesn't mean newer professions like respiratory care don't deserve their moment in the sun. And throughout the years, *AARC Times* has chronicled the efforts of the AARC to make that happen. From our coverage of public relations tools made especially for respiratory therapists to our stories about campaigns like Drive4COPD, which enlisted the support of the AARC and RTs across the nation to draw public attention to specific diseases and conditions, the magazine has documented the push to put RTs in the spotlight.

The single most important thing the AARC has ever done to raise awareness of RTs — and by extension, the single most important thing we have ever covered in the pages of this magazine — was the launch of National Respiratory Care Week. It came, not in October (the traditional month for RC Week), but in November, and the year was 1982.

### Making it official

The first RC Week — called “RT Week” back then because the profession had yet to change its name to “respiratory care” — was celebrated Nov. 7–13, 1982, and it was a long time coming. The AARC had always wanted to establish a week during the year that could be devoted especially to the profession, similar to weeks that were already in place for other fields. But for the first time out, the Association wanted it to be a week officially proclaimed by the U.S. Congress, and that was no easy feat.

As we wrote in our November 1982 article, which was aptly titled, “National Respiratory Therapy Week: We Did It!,” it was the most ambitious and coordinated effort the Association had ever undertaken. “Proclamations of this type are most difficult to obtain,” we noted. “A full two thirds of both houses of Congress must endorse the call for an official declaration.”

How did the AARC do it? According to the story, it took the assistance of hundreds of RTs from all across the country, who wrote the letters and made the phone calls to their members of Congress asking them to support the proclamation. AARC leaders oversaw the initiative. Our story said, “The lobbying effort to obtain the official resolution was led by President John Walton. . . . It included visits to the nation's capital by Walton, President-elect Glen N. Gee, and BOMA Chairman Jim Baker.”

### A twist

It was, indeed, a massive undertaking for all involved. But there is a twist to this story that deserves note as well. Respiratory Care Week also had a direct link to President Ronald Reagan.

Only a year before, President Reagan had been shot while walking to his vehicle in the nation's capital, and respiratory therapists played a key role in the care he received at George Washington University Medical Center. The President recognized those RTs — along with all the other hospital staff who cared for him during his stay — as he left the facility, and he remembered them, too. When it came time to sign the official proclamation for National Respiratory Care Week in 1982, President Reagan invited members of the AARC leadership, including Walton, Gee, and AARC Executive Director Sam Giordano to join him in the Oval Office. Along for the ride was Gee's seven-year-old son Casey, who had asthma, and five-year-old ventilator-dependent patient John Magbie and his RT, Dean Sterling.

The photo in this story appeared in our December 1982 issue, in a wrap-up article on the first RC Week titled “Reagan Proclaims RT Week.” We wrote, “The trip to the White House marked an historic event for the AART, and the declaration of National Respiratory Therapy Week is a statement that respiratory therapy practitioners are making an important contribution to the delivery of quality health care in the nation.”

### The word spreads

AARC Times has been proud to document member activities during National Respiratory Care Week ever since, often letting the photos of those activities speak for themselves. From coast to coast, therapists and their departments have taken RC Week to heart by hosting special events for staff, offering educational sessions for fellow clinicians and the general public, and spreading the word about the great work RTs do for their patients and their organizations every day of the week. As RTs get ready to celebrate National Respiratory Care Week 2019, we should remember all the efforts it took to get here. ■



Little Casey Gee greets President Reagan during the Oval Office signing of the proclamation for the first RC Week in 1982, as John Walton (left) and Glen Gee look on.

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# New Orleans



## Four More Sessions for Your Must-Have List

As you map out the lectures and symposia you will attend at AARC Congress 2019, you might want to consider adding one or more of these sessions to your list. The following previews, which were provided by the presenters, explain why.



## Departmental Research and QI Implementation on a Limited Budget

by Dave Crotwell, BA, RRT, RRT-NPS, FAARC

In today's health care climate, quality improvement (QI) programs are necessary to ensure that our patients receive the highest quality care possible. This statement is true for respiratory care service lines as well. But the development of a respiratory care service line QI/research program does not have to break the bank. New programs can keep costs low by starting with a limited scope to ensure return on investment. In many cases, QI/research programs can save money for an organization by reducing risk or harm to patients and improving efficiency through waste reduction.

There is a fine line between QI and research, and both are needed for us to improve the therapies we provide as respiratory therapists. During this talk, I will discuss my experience helping to create a QI/research program at Seattle Children's Hospital, a 420-bed regional children's hospital covering four states (Washington, Alaska, Montana, and Idaho) and boasting a respiratory care department of more than 130 RRTs.

The presentation will explain how a department can start a QI/research program without significant financial investment. The following topics will be covered:

- Why is QI/research necessary for your department?
- What is the difference between QI and research?
- How can you start a QI/research program with limited funding?
  - Equipment needs
  - Staff resource and expertise
  - QI/research questions
- Where should RTs focus their resources?
- What is the value proposition for QI/research in respiratory care?
- Which quality metrics matter in respiratory care?
- How can we use benchmarking to assess performance?
- Integrated vs. independent QI?

This lecture will highlight the benefits of a respiratory care service QI/research program, with an emphasis on clinical quality and patient safety. I will discuss how we started our program at Seattle Children's Hospital in 2004 and how the program has shaped our clinical practice. The development of a QI/research program has dramatically improved the respiratory care department's clinical practice and employee engagement at Seattle Children's. ■

Dave Crotwell, BA, RRT, RRT-NPS, FAARC, is director of respiratory care services at Seattle Children's Hospital in Seattle, WA.



## Putting the Pressure on Pediatric HighFlow Nasal Cannula

by Ryan M. Sharkey, MSc, RRT, RRT-NPS

The high-flow nasal cannula (HFNC) is an alternative to respiratory support devices embedded in almost all pediatric hospital settings. The popularity of HFNC in pediatrics has spawned many myths and misconceptions, particularly with regard to airway pressure. This presentation will break through those misconceptions and identify important variables to successful management of HFNC.

While pressure is neither set nor measured in HFNC, it is often the most discussed factor when delivering the therapy. Leaks from the mouth, prong sizes, and flow all affect airway pressure and may influence work of breathing. Improvements in work of breathing and the respiratory status of the patient are frequently the main goals of HFNC therapy. Recognizing the aspects of pressure delivery during HFNC plays an important role in the assessment of a patient on HFNC therapy.

RTs are successfully managing sicker patients on HFNC, but only in the last few years has there been any substantial research to help guide this therapy. Outside of bronchiolitis, there are few clinical research studies on managing patients on HFNC or the effect of HFNC. There have been multiple bench studies describing the effects of HFNC as it pertains to pressure and flow delivery to the bench models. This lecture will explore the evidence-based practices provided from these studies.

The discussion will emphasize the importance of understanding the dynamics of HFNC and the latest research to help guide therapies for patients. The complexities of HFNC challenge its comparisons to simple oxygen-delivery devices, even though HFNC remains a safe and effective therapy for respiratory failure in pediatrics. We will take the understanding of HFNC to the next level and "put the pressure on" to get the most out of HFNC therapy. ■

Ryan Sharkey, MSc, RRT, RRT-NPS is the Children's Hospital clinical coordinator at the University of Virginia Medical Center in Charlottesville, VA.



## RTs Revolutionizing CPAP Adherence — How

### Technology Is Improving Outcomes

by Felonda Parker, RRT, RRT-SDS

Population health management, real-time monitoring, predictive analytics, and artificial intelligence: these are key “buzz words” that describe not only future health care trends but current tools being used to transform sleep medicine. Patient management involves a great deal of patient participation. As individuals become increasingly dependent on technology in their daily lives, consumer electronics become the perfect resource to seamlessly connect the provider to the patient.

The role of respiratory therapists in the field of sleep medicine has evolved from technician to therapist to case manager. What is the next logical step in improving a patient’s overall outcomes? Predicting outcomes based on patterns, data input, and what we know about the patient’s therapy, that’s what. In this talk, Heidel S. Trinidad, RRT, RRT-SDS, and I will explore how the use of telemonitoring impacts CPAP adherence; how the use of electronic health record integration is powering predictive analytics and artificial intelligence to improve outcomes such as hospital readmissions; and how consumer electronics are changing sleep disorder management, now and in the future. We’ll also discuss interactive communication between the CPAP user, consumer electronics, and the health care provider. ■

*Felonda Parker, RRT, RRT-SDS, is a respiratory care coordinator at Kaiser Permanente in Fontana, CA.*



## Engaged Students Become Engaged Professionals

by Lisa M. Trujillo, DHSc, RRT

Respiratory therapy students begin their educational programs thinking that the classes they will take will be similar to classes they have taken throughout their primary and secondary school careers. That is only partly true. While respiratory care (RC) courses require students to attend class, do homework, and take tests, in order to truly succeed in the program, students need to reach beyond those traditional school responsibilities. They need to recognize that they are no longer just taking another class on their degree plan; rather, they are preparing to enter a profession that they may very well spend practicing the rest of their working lives. That means they need to step up their level of engagement, both inside and outside of the classroom.

This lecture will stress the importance of becoming engaged as students and how that will carry them more seamlessly into their professional career. I’ll discuss what it means to be “engaged,” avenues for engagement as students, growth that comes from being engaged, and the impact this will have on them when they enter the RT workforce. The talk will feature information about how engagement impacts job satisfaction, as well as the difference between simply *having a job* and *being a professional*, along with some personal examples of how engagement and networking have influenced my own career.

Students who go above and beyond the course requirements during their RC programs and become truly engaged in the information they are learning, are the individuals who go on to become leaders in their hospitals and other organizations. This lecture is designed to ensure that more students have an opportunity for professional engagement at the earliest possible point in their journey to become an RT. ■

*Lisa M. Trujillo, DHSc, RRT, is program director and associate professor in the department of respiratory care and diagnostic science at the University of Kansas in Kansas City, KS.*

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# A MAN FOR ALL SEASONS

**Tim Myers has made an impact on everything from evidence-based medicine to patient education to Association management and more during his 33 years in the profession.**

by Debbie Bunch

As a kid growing up in a largely blue collar area of northeast Ohio, Tim Myers, MBA, RRT, RRT-NPS, FAARC, was instilled at an early age with the values of caring, community, and hard work. Like most boys in his neighborhood, he loved sports and played baseball, football, and basketball in high school. When the cold Ohio winters forced them indoors, Myers and his friends created competitions involving board games they could play at each other's homes.

Myers saved up for college by working for a family friend at a local convenience store during high school, and he enrolled in The Ohio State University (OSU) in Columbus right after graduation in 1984. After completing his first two years at OSU, he knew it was time to settle on a major and began looking closely at those offered through the School of Allied Medicine. "During this time, I also volunteered at a community hospital in physical therapy, as many of these programs required community service upon applying," says Myers. "It was there that I met the profession of respiratory therapy." He loved the teamwork he saw between the therapists and how they



Thomas Kallstrom, left, swears Tim Myers in as the 2009-2010 AARC President at the 2008 AARC Congress.

## Jimmy A. Young Medal

Every year the AARC bestows the Jimmy A. Young Medal on a member of the profession who has exceeded all expectations for meritorious service to the AARC and the advancement of the respiratory care profession. The award was created in 1976 to honor the memory of Jimmy A. Young, MEd, RRT, an exemplary member of the profession and AARC leader who died suddenly at the age of 40. Among Young's many accomplishments were serving as director of the first "inhalation therapy" department at Massachusetts General Hospital in Boston; co-authoring one of the first textbooks on respiratory care, *Principles and Practice of Inhalation Therapy*; and serving as the 22nd president of the AARC. ■



always seemed to enjoy caring for their patients. "The excitement and adrenaline they displayed in scurrying off to take care of patients in the ED or ICU encouraged me to take a closer look at the profession and apply," he says.

A meeting with the OSU program director, long-time AARC and Ohio Society for Respiratory Care member F. Herb Douce, MS, RRT, RRT-NPS, RPFT, sealed the deal. Myers left the session knowing exactly what he wanted to do with the rest of his life. And while he couldn't have even guessed it at the time, the amazing journey he was about to embark on — one encompassing 10 clinical grants totaling \$975,000, 27 peer-reviewed publications, 69 abstracts, six books or book chapters, service on numerous editorial boards, lectures presented across the nation and around the world, and AARC leadership — would ultimately lead to his selection as the AARC's 2019 Jimmy A. Young Medalist.

### **Pediatrics stole his heart**

Today Myers serves as chief business officer for the AARC, but the majority of his three-plus decades in respiratory care has been devoted to patient



Tim Myers, left, joined Thomas Kallstrom, right, in a visit to the legendary Dr. Forrest Bird on his ranch in Sagle, ID, a few months before he passed away.



Myers addressing the crowd at the 4th Annual Respiratory Patient Advocacy Summit in Las Vegas, NV.

care and research, most specifically that which pertains to infants and children. “During my clinical rotations, I was captivated by the autonomy and care provided by therapists in the pediatric settings,” says Myers. “During the final quarter of our senior year, Ohio State allowed its students to put together ten weeks of elective clinical rotations. I utilized seven of those weeks to rotate — and in fact interview — at children’s hospitals in Cincinnati, Dayton, Columbus, and Cleveland.”

He spent the other three weeks rotating with hospital administrators, but in the end, pediatrics captured his heart. “It was during this time that I was convinced that neonatal-pediatrics was the right fit for me, and the respiratory department at Rainbow seemed to be a perfect fit to advance my knowledge, skills, and career opportunities.” After a year-long stint as a student therapist at the OSU hospital, he signed on with Rainbow in June 1989 and worked in multiple areas of the hospital for the next six years.

“I think the concept that moved me the most was that true miracles happen every day at children’s hospitals,” says Myers, noting that children, as opposed to some adults, never want to be in the hospital and they are always driven to get better so they can go home and be with their family and friends. He found that the diversity of the Rainbow work environment, with its strong emphasis on evidence-based care and a desire to “be better tomorrow,” was the perfect match for his career goals. “The fact that the physicians and nurses respected and trusted respiratory care to provide care that was traditional in nature, as well as across disciplines, always made the environment different and unique and brought forth continual challenges and opportunities,” he says.

Those early years working mainly in critical care, however, were not to predict the future for Myers. “I have to admit that the first seven years of my career I was an ICU and transport junkie,” he says. “But the desire to move from the nightshift, along with an interest in why our children with asthma did not have the highest metrics in a benchmarking program with other children’s hospitals, led me to interview for a disease manager role.” Carolyn Kercksmar, MD, who headed up the asthma center at Rainbow, convinced him to join her in her mission to change the “Asthma World of Rainbow” — a.k.a. asthma care as delivered by Rainbow Babies & Children. “She was and is an incredible clinician, and an inspirational mentor,” says Myers.

Dr. Kercksmar specifically enlisted Myer’s help in developing and implementing a novel asthma care path, and she continued to work with him on numerous projects and programs — including several research studies — over the ensuing years. “It was always clear that Tim had exceptional dedication to the profession, a keen intellect, and strong leadership skills,” says the physician. “He went on to become the pediatric RT director, the de facto research data manager for the Pediatric Pulmonology Asthma Center, and a close colleague and friend,” she says. “I could always count on Tim to help design, initiate, and complete clinical and research projects that helped us improve outcomes for our patients with asthma.”

### Making a difference

Myers believes his biggest contributions were pushing for standardized protocols, ensuring appropriate discharge planning and follow-up, and assisting the team as it pursued best practices in the care of kids with asthma.



Tim Myers with respiratory therapy students and faculty at China Medical University in Taichung City, Taiwan. Myers was hosted by AARC members Chia-Chen Chu and Chin-Jung Liu prior to the Respiratory Therapist Society of Republic of China meeting in December 2009.

As Dr. Kercksmar noted, research was a big part of the mix, and Myers is particularly proud of the studies he was able to conduct, first at Rainbow and later at Case Western Reserve University, citing RT mentors like Robert Chatburn, MHHS, RRT, RRT-NPS, FAARC; Thomas Kallstrom, MBA, RRT, FAARC; John Salyer, MBA, RRT, RRT-NPS, FAARC; Marvin Lough, MBA, RRT, FAARC; Michael Tracy, BA, RRT, RRT-NPS; and Kathleen Deakins, RRT, RRT-NPS, FAARC, for helping him reach his goals in this area.

Physician colleagues such as Dr. Kercksmar, Jeffrey Blumer, MD; Michael Anderson, MD; Paul Smith, MD; Richard Martin, MD; Pamela Davis, MD; Michael Konstan, MD; and James Chmiel, MD, also provided Myers with the support and mentoring he needed to keep his motivations high. “While we did a number of bench studies and equipment evaluations that solidified my understanding of scientific methodology and research, I am most proud of the research we did in process improvement, best practices, and clinical trials that impacted the patients and families we cared for on a daily basis,” says Myers. “The fact that these things made a difference in a child’s life were the most rewarding.”

When asked to name the three studies he is most proud of, Myers cites “A Cost-Effective Algorithm for Children Hospitalized for Status Asthmaticus,” published in the *Archives of Pediatric and Adolescent Medicine* in 1998; “A Pediatric Asthma Unit Staffed by Respiratory Therapists Demonstrates Positive Clinical



Tim Myers evaluates an attendee in the Drive4COPD booth at the 2007 AARP Convention.

and Financial Outcomes,” published in *RESPIRATORY CARE* in 1998, and “Ipratropium Bromide Plus Nebulized Albuterol for the Treatment of Hospitalized Children with Acute Asthma,” published in *The Journal of Pediatrics* in 2001. The first was his first publication and documented improvements in patient care outcomes for patients treated via respiratory therapist driven protocols. The second was his first publication as a primary author and demonstrated that disease management provided by RTs in a hospital setting

could enhance outcomes for patients, families, and the hospital itself.

The third study took a closer look at a medication commonly used for pediatric asthma, ipratropium bromide. He and his fellow investigators found that the drug came with additional costs but no clinical benefit to the patient. “This study would go on to be cited in future evidence-based asthma guidelines as a piece of key evidence to not recommend this combination therapy,” says Myers. “The study went on to hold up in several additional clinical trials that also demonstrated the same lack of benefit.”

### Destined for greatness

Kathleen Deakins, who now serves as RT department director at Rainbow, has known Myers since he first came to work at the hospital in 1989 and says that even back then she knew he was destined for greatness. “He was the most confident ‘young pup’ I had ever seen,” says Deakins. “Evidence-based science and knowledge in pediatrics put him on the map in respiratory care. He became an expert on pediatric asthma.”

His management skills always impressed her as well. “He built an administrative team of a manager and coordinators,” she says. “His persistence and wheeling and dealing style of management improved the strength of our department.” He went above and beyond the typical RT manager in terms of responsibility, too, becoming not only director of respiratory care but also of vascular access, in vitro fertilization, infant monitoring, cardiology, gastrointestinal, and the sedation unit — a feat he accomplished even after leaving Rainbow for a time to work in research and asthma management positions at Case Western Reserve, where he still serves as an adjunct professor.

Deakins says Myers went above and beyond for the AARC — an organization he joined as soon as he decided respiratory therapy would be his major at OSU in 1986 — doing everything in his power to encourage RTs on staff to join the Association and eventually making membership one of the requirements that had to be met to reach “exemplary status” in the department. “I heard many stories about the AARC trips and all the people he met along the way,” says Deakins. “He was so proud to be a part of the AARC, it is no surprise that he went there to work.”

### It all started with the OPEN FORUM

Myers says the AARC has always been a big part of his professional life. “My first AARC meeting was in 1996 in San Diego. I was fascinated with the OPEN FORUM presentations, and that launched my desire to conduct my own

studies moving forward,” he says. His participation in the OPEN FORUM led him to volunteer to work with the AARC on Environmental Protection Agency grants aimed at developing pediatric asthma educational programs for RTs, and by the year 2000 he was asked to run for chair of the Neonatal-Pediatrics Specialty Section. He won, and in the process became one of two section chairs (the other being from the Management Section) to sit on the AARC Board of Directors. More AARC work followed, and then in 2008 Myers was elected to serve as AARC president.

His term ran from 2009-2010, and during those years he presided over a number of new ventures for the Association, from its entry into the world of social media, to the launch of the Virtual Museum and Leadership Institute, to Drive4COPD and the National Ventilator Survey conducted on behalf of the federal government. He also played an integral role in advocating for the profession’s role in sleep medicine and oversaw an expansion of AARC membership to more than 50,000, plus the addition of Saudi Arabia as the Association’s first international affiliate.

Myers has been integrally involved with RESPIRATORY CARE over the years, too. “I was quite honored when I was asked to work with the Journal on Journal Conferences as both a faculty member and a co-chair,” he says. “Those endeavors, along with my work on OPEN FORUM reviews and moderating sessions, led to being asked to serve on the Editorial Board.”

Former Journal Editor Dean Hess, PhD, RRT, FAARC, first met Myers more than 20 years ago when Myers presented an abstract at the OPEN FORUM. “I recall his co-author, Rob Chatburn, introducing us and Rob asking that I not be too tough on a first time presenter,” Hess says. “As I recall, a very young Tim handled himself with ease at the podium.” In the years since, Hess has worked with Myers on Clinical Practice Guidelines, the first AARC Aerosol Delivery Guide, and, of course, on the Journal’s Editorial Board.

“He has a passion for the profession, which I have observed in the United States and abroad,” says Dr. Hess. “He is also a strong advocate for the scientific basis of respiratory care and an evidence-based practice.” Myers says the chance to interact with Dr. Hess and the rest of the Journal staff and the other Editorial Board members has made a great impact on his career, providing him with the ability to maximize his own knowledge and understanding of evidence-based medicine.

### The perfect choice

With more than 25 years of experience in clinical care, patient education, research, management, and service behind him, Myers moved on to an even bigger

role in the profession. Ray Masferrer, RRT, FAARC, who served as an associate executive director of the AARC and managing editor of the *Journal* for many years until his retirement, believes that was just inevitable.

“During my 55 years in the respiratory care profession, I have met and worked with the best and brightest in the field,” says Masferrer. “Tim is certainly one of them.” He says his admiration for Myers is based not only on his tireless work ethic but on the fact that he’s always been an RT who is interested in the science of respiratory care. “His list of accomplishments at a relatively young age is enormous but is highlighted by his research and publication of materials benefiting patients and their care,” says Masferrer. “Today respiratory care is among the top professions in health care, and Tim’s contributions throughout the years have had a great impact on who we are.”

Those characteristics made Myers the perfect choice when the AARC began seeking an RT to take on the new role of associate executive director of brands management in July 2012. He had recently completed his master’s degree and was working in a hospital administration role when then AARC Executive Director Sam Giordano, MBA, RRT, FAARC, and current Executive Director and CEO Thomas Kallstrom, MBA, RRT, FAARC, approached him about the opportunity. “Sam and Tom made the role flexible and enticing enough that I could not say no to them,” says Myers. The opportunity came as Giordano was getting ready to retire and Kallstrom was poised to take over the reins of the Association; Myers saw the job as his chance to do his part in ensuring that the excellent service and leadership that had always been the hallmark of the AARC would continue as the “next generation” of therapists assumed leadership roles.

Kallstrom knew Myers was the right person for the job. “I met Tim back in the early 1990s when he was hired at Rainbow Babies & Children’s Hospital in Cleveland as a new graduate respiratory therapist,” he says. “During his time at Rainbow, Tim learned to be a great clinician as well as researcher. He later moved into management but never stopped being a clinician or researcher.”

Myers brought that mindset to all of the roles he has played with the AARC over the years, continues Kallstrom, including his term as president. “His keen intellect and ability to interact positively with the board, members, and even those outside of the profession showed that he cared,” he says. “As an employee of the AARC’s Executive Office, his contributions to the profession continue.” Indeed, Myers was promoted to the chief business officer position precisely because the AARC leadership could see that he had the knowledge and the

even-handed personality needed to lead the organization further into the 21st century.

Kallstrom cites a recent board meeting as a case in point. “Tim quoted his father as the board was dealing with a very sensitive issue. He told us that his dad once told him that, when making important decisions, measure twice and cut once. I took that to heart,” Kallstrom says. “Sometimes we act before we think things through. I am sure his father would be very proud of him.”

### Humbling experience

When Myers learned he would be receiving this year’s Jimmy A. Young Medal — the highest honor the Association has to give — he says he initially thought his friends in the profession were just playing a trick on him. “I was looking for MTV’s ‘Punked’ cameras and crew,” he says with a laugh. But then he gets serious. “The call absolutely left me speechless and at a true loss for words,” he says. “When you look at the past recipients of the Jimmy A. Young Medal and their accomplishments, it is truly a humbling experience to even be mentioned in the same breath as those previous award winners.”

Myers says the award has made him stop and reflect on his 33 years as a member of the AARC and what that membership has given him, both professionally and personally. “The AARC and its vast network of colleagues, mentors, and friends has allowed me to be a part of something that is greater than the sum of its parts,” says the 2019 Medalist. ■



Tim Myers, left, greets Saudi Arabia’s Minister of Health at the Saudi Society for Respiratory Care in Riyadh, Saudi Arabia, as former AARC Executive Director Sam Giordano looks on.

# The RT's Role in End of Life in the Intensive Care Unit

by Melissa Ash, RRT, RRT-ACCS, AE-C

A 70-year-old woman was admitted to the ICU after she was thrown from a horse. Upon injury, she experienced cardiac arrest, was intubated, and life support was initiated. A spinal cord injury was suspected, and she was transferred to a spinal center, where she was diagnosed with a C-2 fracture and was classified as ASIA A (Table 1). At that time, a tracheostomy tube was inserted. When the patient was able to communicate with the medical staff, she voiced her wishes that she did not want to live the rest of her life on a mechanical ventilator. Her family was in agreement. They expressed that ultimately if the patient did not want to live, they would agree to morphine being hung and the ventilator being turned off. During the next week, she was evaluated by psychiatry, neurology, surgery, rehabilitation, respiratory therapy and palliative care. An ethics meeting was called, and several different scenarios were discussed, including discontinuing mechanical ventilation. Based on the main ethical principles that guide health care professionals, what should the medical team decide to do? What part does the respiratory therapist play in this scenario?

When health care professionals are faced with difficult decisions, they can turn to the four main ethical principles for guidance:

- Autonomy refers to the right of the patient to retain control over his or her body.<sup>1</sup>
- Beneficence states that health care providers must do all they can to benefit the patient in each situation.<sup>1</sup>
- Non-Maleficence means do no harm.<sup>1</sup>
- Justice states that there should be an element of fairness in all medical decisions: fairness in decisions that burden and benefit, as well as

equal distribution of scarce resources and new treatments, and for medical practitioners to uphold applicable laws and legislation.<sup>1</sup>

Balancing these four principles can be difficult. Every situation should be carefully examined because every patient is unique. Identifying which principle takes priority is a challenge that health care professionals face.

Comfort care is a form of medical care that focuses on relieving symptoms and optimizing comfort as patients undergo the dying process.<sup>2</sup> When considering comfort care, there are four components to consider: pain, social isolation, impaired comfort, and social withdraw. Pain medications, soft touch, and the patient's position in bed will help make sure the patient is as comfortable as possible. Patients should be permitted to sleep if they prefer. The medical team should aid the patient in accepting that death is near.<sup>3</sup> Often, comfort care and palliative care are used interchangeably. Palliative care is a multidisciplinary team approach with the purpose to improve the patient's quality of life. Palliative care should not accelerate or delay death. It addresses issues such as advance directives, difficult decisions, and goals

related to the management of care, pain and symptoms management. Palliative care offers support not only to the patient but to the family as well. A major component of palliative care involves communication between the patient and the medical team, as well as between the patient and their family.<sup>4</sup>

When the patient, described earlier, first expressed that she did not want to continue living her life dependent on the ventilator, the ethics committee held a meeting. During an ethics meeting between the patient and her medical

### about the author...



Melissa Ash, RRT, RRT-ACCS, AE-C, is a respiratory therapist at Thomas Jefferson University Hospital in Philadelphia, PA where she has worked for the past 15 years in both the Surgical Intensive Care Unit and the Neonatal Intensive Care Unit.

team, the respiratory therapist questioned whether removing the ventilator was an ethically supported act. The RT knew that the patient could potentially live her life as a ventilator-dependent quadriplegic and she worried that removing the ventilator was intentionally killing her. The medical team had an obligation to provide in-depth details about the benefits and disadvantages of treatments that were available, as well as the result of withholding or withdrawing treatment. The patient was informed that her life could continue as a quadriplegic on the ventilator and that the rehabilitation team would teach her and her caregivers how to provide for her future needs. They made sure she was aware that, if she chose to have the ventilator removed and have morphine administered, she would die.

If the ethics committee decided to honor the patient's autonomy, would this action contradict the ethical principle of non-maleficence and the oath that they took to do no harm? By withdrawing the ventilator, the medical team would not be providing the full extent of all available medical treatment, thus violating the principle of beneficence. The medical team provided extensive details about how it was possible for the patient to continue to live on a ventilator, in a wheelchair and with the help of the rehabilitation team, most likely in a nursing home. They also explained in length to the patient that living as a quadriplegic would require extensive ongoing medical care that eventually might become a financial burden to her family. By providing

this information, they made sure that the principle of justice was not violated.

The ethics committee concluded that if the technology being used in her care today did not exist, the patient would have died. The technology was keeping her alive; looked at another way, the technology was hindering the natural death process. In the end, the patient had the right to autonomy, and the medical team had an obligation to respect that. After the ethics meeting concluded, the patient's wishes were carried out. She was placed on a morphine drip and mechanical ventilation was discontinued. The patient passed peacefully with her loved ones surrounding her.

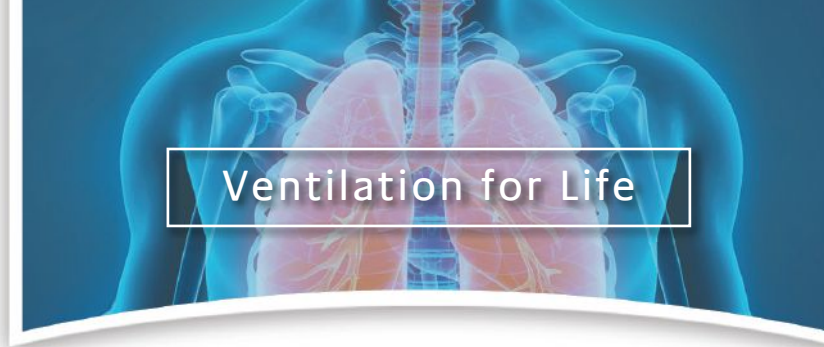
In the above situation, the respiratory therapist met with the ethics team and was a vital part of the conversation. In most cases, this is a rare occurrence. In a critical care setting, the respiratory therapist plays an important role on the medical team. They provide expertise in the management of patients with a respiratory illness. They are responsible for the patient's airway as well as the management of life support equipment. However, very rarely are they included in end of life discussions.<sup>5</sup> A 2016 study by Grandhige et al found that only 6.6% of respiratory therapist surveyed were frequently or always included in these discussions.<sup>5</sup> The same study found that 47.5% of therapists wanted to be included when the goal of the meeting was to discuss withdrawal of ventilator support.<sup>5</sup> Being involved in these conversations can help relieve anxiety and moral distress for the respiratory therapist, allowing them to provide more comfort and minimizing stress for the patient and the family.<sup>5</sup>

**Table 1. American Spinal Injury Association Impairment Scale**

Classification	Impairment	Definition
ASIA A	Complete	No motor or sensory function is preserved in the sacral segments S4-S5
ASIA B	Incomplete	Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5
ASIA C	Incomplete	Motor function is preserved below the neurological level and more than half of the key muscles below the neurological level have a muscle grade less than 3
ASIA D	Incomplete	Motor function is preserved below the neurological level, and at least half of the key muscles below the neurological level have a muscle grade of 3 or more
ASIA E	Normal	motor and sensory function are normal

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## Mechanical Ventilation Strategies of ECMO Patients

by John Davies, MA, RRT, FAARC, FCCP

The first successful clinical application of extracorporeal membrane oxygenation (ECMO) for acute respiratory distress syndrome (ARDS) was described 47 years ago.<sup>1</sup> This technique, however, was used infrequently for refractory hypoxemia or hypercapnia up until about a decade ago with the H1N1 influenza pandemic and the CESAR randomized controlled trial, which showed a mortality benefit in patients with ARDS referred for venovenous ECMO (VV-ECMO).<sup>2</sup> Since that time, the use of VV-ECMO for acute respiratory distress syndrome (ARDS) has significantly increased.<sup>3</sup> Current guidelines for lung protective ventilator management call for limiting the tidal volume (6 ml/kg of predicted body weight or PBW) and the plateau pressure ( $\leq 30$  cm H<sub>2</sub>O).<sup>4</sup> The limiting of the tidal volume ( $V_t$ ) is based on the fact that patients with ARDS suffer from heterogeneous lung injury and portions of the  $V_t$  get diverted from injured (low compliance) alveoli to healthy alveoli causing local overdistention. These healthy units then become injured themselves thus reducing the amount of functional lung area. The increasing use of VV-ECMO use has raised questions as to the best ways to manage mechanical ventilatory support during VV-ECMO. Current recommendations from the Extracorporeal Life Support Organization (ELSO) call for an  $FiO_2 < 0.4$  and “non-damaging rest settings” (ie, plateau pressure  $< 25$  cm H<sub>2</sub>O).<sup>3,4</sup> The benefit of VV-ECMO is that it helps maintain adequate oxygenation and ventilation while the conventional mechanical ventilator settings are reduced. However, the best way to manage mechanical ventilation during VV-ECMO remains unknown. This article will examine the available evidence relating to strategies that have been introduced during the proliferation of VV-ECMO use for hypoxemic respiratory failure.<sup>4</sup>

While lung protective strategies are commonly used for patients on mechanical ventilation, there is no clear consensus about whether this strategy is appropriate for patients on VV-ECMO. A recent survey of 141 ELSO reporting centers in 28 countries found that ventilator management varied considerably. This highlights the uncertainty surrounding the optimal ventilator management strategy.<sup>5</sup> More recently, two studies

reported a mortality benefit when using ARDSnet lung-protective strategies.<sup>6,7</sup> However, it still remains unknown whether the further reduction of mechanical ventilation support to an absolute minimum (eg,  $V_t$  2–3 mL/kg PBW and pressures  $< 15$  cm H<sub>2</sub>O) has a role during VV-ECMO; the question applies to the use of apneic or near-apneic conditions as well. Araos et al<sup>8</sup> investigated this strategy in a porcine model. After lung injury was induced, the animals were placed on VV-ECMO and separated into three groups: nonprotective ventilation (PEEP = 5 cm H<sub>2</sub>O,  $V_t$  = 10 mL/kg PBW, respiratory rate = 20 breaths/min); conventional protective ventilation (PEEP = 10 cm H<sub>2</sub>O,  $V_t$  = 6 mL/kg PBW, respiratory rate = 20 breaths/min); and near-apneic ventilation (PEEP = 10 cm H<sub>2</sub>O,  $V_t$  = 2

mL/kg PBW, driving pressure = 10 cm H<sub>2</sub>O, respiratory rate 5 breaths/min). The authors found that near-apneic ventilation significantly decreased histologic lung injury compared with both the nonprotective and the conventional protective ventilator strategies. In addition, driving pressure and mechanical power were positively correlated with lung injury scores, which is consistent with the literature. In a meta-analysis of observational studies in adult ARDS patients (nine studies including 545 patients) receiving ECMO for refractory hypoxemia, Serpa Neto and colleagues<sup>9</sup> reported that a driving pressure of 14.5 cm H<sub>2</sub>O (driving pressure for survivors

### about the author...



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The primary endpoint was change from baseline in trough (predose) FEV<sub>1</sub> at day 85 vs placebo: YUPELRI demonstrated a statistically significant difference vs placebo in study 1 (146 mL,  $P < .0001$  [YUPELRI, n=189; placebo, n=191]) and study 2 (147 mL,  $P < .0001$  [YUPELRI, n=181; placebo, n=187]).<sup>1,2</sup>

In study 1, LS mean changes from baseline in FEV<sub>1</sub> ranged from 55.8 mL to 240.4 mL in the YUPELRI group, and from -113.6 mL to 59.6 mL in the placebo group. In study 2, LS mean changes from baseline in FEV<sub>1</sub> ranged from 19.8 mL to 148.5 mL in the YUPELRI group, and from -176.4 mL to -13.0 mL in the placebo group.

In studies 1 and 2, a prespecified exploratory analysis using serial spirometry was performed on a substudy population (YUPELRI, n=89; placebo, n=83) over 24 hours on days 84/85. In a pooled analysis, YUPELRI demonstrated consistent improvement in trough FEV<sub>1</sub> vs placebo over the 24-hour period.



### Demonstrated safety profile<sup>1</sup>

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## Indication

YUPELRI<sup>®</sup> inhalation solution is indicated for the maintenance treatment of patients with chronic obstructive pulmonary disease (COPD).

## Important Safety Information

YUPELRI is contraindicated in patients with hypersensitivity to revefenacin or any component of this product.

YUPELRI should not be initiated in patients during acutely deteriorating or potentially life-threatening episodes of COPD, or for the relief of acute symptoms, i.e., as rescue therapy for the treatment of acute episodes of bronchospasm. Acute symptoms should be treated with an inhaled short-acting beta<sub>2</sub>-agonist.

As with other inhaled medicines, YUPELRI can produce paradoxical bronchospasm that may be

life-threatening. If paradoxical bronchospasm occurs following dosing with YUPELRI, it should be treated immediately with an inhaled, short-acting bronchodilator. YUPELRI should be discontinued immediately and alternative therapy should be instituted.

YUPELRI should be used with caution in patients with narrow-angle glaucoma. Patients should be instructed to immediately consult their healthcare provider if they develop any signs and symptoms of acute narrow-angle glaucoma, including eye pain or discomfort, blurred vision, visual halos or colored images in association with red eyes from conjunctival congestion and corneal edema.

Worsening of urinary retention may occur. Use with caution in patients with prostatic hyperplasia or bladder-neck obstruction and instruct patients to contact a healthcare provider immediately if symptoms occur.

Immediate hypersensitivity reactions may occur after administration of YUPELRI. If a reaction occurs, YUPELRI should be stopped at once and alternative treatments considered.

The most common adverse reactions occurring in clinical trials at an incidence greater than or equal to 2% in the YUPELRI group, and higher than placebo, included cough, nasopharyngitis, upper respiratory infection, headache and back pain.

Coadministration of anticholinergic medicines or OATP1B1 and OATP1B3 inhibitors with YUPELRI is not recommended.

YUPELRI is not recommended in patients with any degree of hepatic impairment.

**Please see Brief Summary of Full Prescribing Information on the adjacent pages.**

Learn more at [YUPELRIHCP.com](http://YUPELRIHCP.com)

**References:** 1. YUPELRI [package insert]. Morgantown, WV: Mylan Specialty L.P.; May 2019. 2. Data on file.

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#### INDICATIONS AND USAGE

YUPELRI inhalation solution is indicated for the maintenance treatment of patients with chronic obstructive pulmonary disease (COPD).

#### CONTRAINDICATIONS

YUPELRI is contraindicated in patients with hypersensitivity to revefenacin or any component of this product.

#### WARNINGS AND PRECAUTIONS

##### Deterioration of Disease and Acute Episodes

YUPELRI should not be initiated in patients during acutely deteriorating or potentially life-threatening episodes of COPD. YUPELRI has not been studied in subjects with acutely deteriorating COPD. The initiation of YUPELRI in this setting is not appropriate.

YUPELRI is intended as a once-daily maintenance treatment for COPD and should not be used for relief of acute symptoms, i.e. as rescue therapy for the treatment of acute episodes of bronchospasm, and extra doses should not be used for that purpose. Acute symptoms should be treated with an inhaled, short-acting beta<sub>2</sub>-agonist.

COPD may deteriorate acutely over a period of hours or chronically over several days or longer. If YUPELRI no longer controls symptoms of bronchoconstriction, the patient's inhaled, short-acting beta<sub>2</sub>-agonist becomes less effective, or the patient needs more inhalations of a short-acting beta<sub>2</sub>-agonist than usual, these may be markers of deterioration of disease. In this setting, a re-evaluation of the patient and the COPD treatment regimen should be undertaken at once. Increasing the daily dose of YUPELRI beyond the recommended dose is not appropriate in this situation.

##### Paradoxical Bronchospasm

As with other inhaled medicines, YUPELRI can produce paradoxical bronchospasm that may be life-threatening. If paradoxical bronchospasm occurs following dosing with YUPELRI, it should be treated immediately with an inhaled, short-acting bronchodilator. YUPELRI should be discontinued immediately and alternative therapy should be instituted.

##### Worsening of Narrow-Angle Glaucoma

YUPELRI should be used with caution in patients with narrow-angle glaucoma. Prescribers and patients should be alert for signs and symptoms of acute narrow-angle glaucoma (e.g. eye pain or discomfort, blurred vision, visual halos or colored images in association with red eyes from conjunctival congestion and corneal edema). Instruct patients to consult a physician immediately if any of these signs or symptoms develops.

##### Worsening of Urinary Retention

YUPELRI should be used with caution in patients with urinary retention. Prescribers and patients should be alert for signs and symptoms of urinary retention (e.g. difficulty passing urine, painful urination), especially in patients with prostatic hyperplasia or bladder-neck obstruction. Instruct patients to consult a healthcare provider immediately if any of these signs or symptoms develops.

##### Immediate Hypersensitivity Reactions

Immediate hypersensitivity reactions may occur after administration of YUPELRI. If such a reaction occurs, therapy with YUPELRI should be stopped at once and alternative treatments should be considered.

#### ADVERSE REACTIONS

The following potential adverse reactions are described in greater detail in other sections:

- Paradoxical bronchospasm [see Warnings and Precautions]
- Worsening of narrow-angle glaucoma [see Warnings and Precautions]
- Worsening of urinary retention [see Warnings and Precautions]
- Immediate hypersensitivity reactions [see Warnings and Precautions]

##### Clinical Trial Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice.

The YUPELRI safety database included 2,285 subjects with COPD in two 12-week efficacy studies and one 52-week long-term safety study. A total of 730 subjects received treatment with YUPELRI 175 mcg once daily. The safety data described below are based on the two 12-week trials and the one 52-week trial.

##### 12-Week Trials

YUPELRI was studied in two 12-week replicate placebo-controlled trials in patients with moderate to very severe COPD (Trials 1 and 2). In these trials, 395 patients were treated with YUPELRI at the recommended dose of 175 mcg once daily.

The population had a mean age of 64 years (range from 41 to 88 years), with 50% males, 90% Caucasian, and had COPD with a mean post-bronchodilator forced expiratory volume in one second (FEV<sub>1</sub>) percent predicted of 55%. Of subjects enrolled in the two 12-week trials, 37% were taking concurrent LABA or ICS/LABA therapy. Patients with unstable cardiac disease, narrow-angle glaucoma, or symptomatic prostatic hypertrophy or bladder outlet obstruction were excluded from these trials.

Table 1 shows the most common adverse reactions that occurred with a frequency of greater than or equal to 2% in the YUPELRI group and higher than placebo in the two 12-week placebo-controlled trials.

The proportion of subjects who discontinued treatment due to adverse reactions was 13% for the YUPELRI-treated subjects and 19% for placebo-treated subjects.

**Table 1: Adverse Events with YUPELRI ≥2% Incidence and Higher than Placebo**

	Placebo (N = 418)	YUPELRI 175 mcg (N = 395)
<b>Respiratory, Thoracic and Mediastinal Disorders</b>		
Cough	17 (4%)	17 (4%)
<b>Infections and Infestations</b>		
Nasopharyngitis	9 (2%)	15 (4%)
Upper respiratory tract infection	9 (2%)	11 (3%)
<b>Nervous System Disorders</b>		
Headache	11 (3%)	16 (4%)
<b>Musculoskeletal and Connective Tissue Disorders</b>		
Back pain	3 (1%)	9 (2%)

Other adverse reactions defined as events with an incidence of ≥1.0%, less than 2.0%, and more common than with placebo included the following: hypertension, dizziness, oropharyngeal pain, and bronchitis.

##### 52-Week Trial

YUPELRI was studied in one 52-week, open-label, active-control (tiotropium 18 mcg once daily) trial in 1,055 patients with COPD. In this trial, 335 patients were treated with YUPELRI 175 mcg once daily and 356 patients with tiotropium. The demographic and baseline characteristics of the long-term safety trial were similar to those of the placebo-controlled 12-week studies described, with the exception that concurrent LABA or LABA/ICS therapy was used in 50% of patients. The adverse reactions reported in the long-term safety trial for YUPELRI were consistent with those observed in the placebo-controlled studies of 12-weeks.

#### DRUG INTERACTIONS

##### Anticholinergics

There is potential for an additive interaction with concomitantly used anticholinergic medicines. Therefore, avoid coadministration of YUPELRI with other anticholinergic-containing drugs as this may lead to an increase in anticholinergic adverse effects [see Warnings and Precautions].

##### Transporter-Related Drug Interactions

OATP1B1 and OATP1B3 inhibitors (e.g. rifampicin, cyclosporine, etc.) could lead to an increase in systemic exposure of the active metabolite. Therefore, coadministration with YUPELRI is not recommended [see Clinical Pharmacology].

#### USE IN SPECIFIC POPULATIONS

##### Pregnancy

###### Risk Summary

There are no adequate and well-controlled studies with YUPELRI in pregnant women. Women should be advised to contact their physician if they become pregnant while taking YUPELRI. In animal reproduction studies, subcutaneous administration of revefenacin to pregnant rats and rabbits during the period of organogenesis produced no evidence of fetal harm at respective exposures approximately 209 times the exposure at the maximum recommended human dose (MRHD) (on an area under the curve [AUC] basis) [see Data].

The estimated background risk of major birth defects and miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

#### Data

##### Animal Data

In an embryo fetal development study in pregnant rats dosed during the period of organogenesis from gestation days 6 to 17, revefenacin was not teratogenic and did not affect fetal survival at exposures up to 209 times the MRHD (based upon summed AUCs for revefenacin and its active metabolite at maternal subcutaneous doses up to 500 mcg/kg/day).

In an embryo fetal development study in pregnant rabbits dosed during the period of organogenesis from gestation days 7 to 19, revefenacin was not teratogenic and did not affect fetal survival at exposures up to 694 times the MRHD (based upon summed AUCs for revefenacin and its active metabolite at maternal subcutaneous doses up to 500 mcg/kg/day).

Placental transfer of revefenacin and its active metabolite was observed in pregnant rabbits.

In a pre- and postnatal development (PPND) study in pregnant rats dosed during the periods of organogenesis and lactation from gestation day 6 to lactation day 20, revefenacin had no adverse developmental effects on pups at exposures up to 196 times the MRHD (based upon summed AUCs for revefenacin and its active metabolite at maternal subcutaneous doses up to 500 mcg/kg/day).

##### Lactation

###### Risk Summary

There is no information regarding the presence of revefenacin in human milk, the effects on the breastfed infant, or the effects on milk production. However, revefenacin was present in the milk of lactating rats following dosing during pregnancy and lactation [see Data].

The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need for YUPELRI and any potential adverse effects on the breastfed infant from YUPELRI or from the underlying maternal condition.

#### Data

##### Animal Data

In a PPND study [see Pregnancy], revefenacin and its active metabolite were present in milk of lactating rats on lactation day 22. Milk-to-plasma concentration ratios were up to 10 for revefenacin and its active metabolite.

##### Pediatric Use

YUPELRI is not indicated for use in children. The safety and efficacy in pediatric patients have not been established.

##### Geriatric Use

Based on available data, no adjustment of the dosage of YUPELRI in geriatric patients is necessary.

Clinical trials of YUPELRI included 441 subjects aged 65 years and older, and of those, 101 subjects were aged 75 years and older. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out.

##### Hepatic Impairment

The systemic exposure of revefenacin is unchanged while that of its active metabolite is increased in subjects with moderate hepatic impairment. The safety of YUPELRI has not been evaluated in COPD patients with mild-to-severe hepatic impairment. YUPELRI is not recommended in patients with any degree of hepatic impairment. [see Clinical Pharmacology].

##### Renal Impairment

No dosage adjustment is required in patients with renal impairment. Monitor for systemic antimuscarinic side effects in COPD patients with severe renal impairment. [see Clinical Pharmacology].

##### OVERDOSAGE

An overdose of YUPELRI may lead to anticholinergic signs and symptoms such as nausea, vomiting, dizziness, lightheadedness, blurred vision, increased intraocular pressure (causing pain, vision disturbances, or reddening of the eye), obstipation or difficulties in voiding. In COPD patients, orally inhaled administration of YUPELRI at a once-daily dose of up to 700 mcg (4 times the maximum recommended daily dose) for 7 days was well tolerated.

Treatment of overdose consists of discontinuation of YUPELRI along with institution of appropriate symptomatic and/or supportive therapy.

#### NONCLINICAL TOXICOLOGY

##### Carcinogenesis, Mutagenesis, Impairment of Fertility

Two-year inhalation studies in Sprague-Dawley rats and

CD1 mice were conducted to assess the carcinogenic potential of revefenacin. No evidence of tumorigenicity was observed in male and female rats at inhaled doses up to 338 mcg/kg/day (approximately 35 times the MRHD based upon summed AUCs for revefenacin and its active metabolite). No evidence of tumorigenicity was observed in male and female mice at inhaled doses up to 326 mcg/kg/day (approximately 40 times the MRHD based upon summed AUCs for revefenacin and its active metabolite).

Revefenacin and its active metabolite were negative for mutagenicity in the Ames test for bacterial gene mutation. Revefenacin was negative for genotoxicity in the *in vitro* mouse lymphoma assay and *in vivo* rat bone marrow micronucleus assay.

There were no effects on male or female fertility and reproductive performance in rats at subcutaneous revefenacin doses up to 500 mcg/kg/day (approximately 30 times the MRHD on an mg/m<sup>2</sup> basis for revefenacin).

#### PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Patient Information and Instructions for Use) with each new prescription and refill.

##### Not for Acute Symptoms

Inform patients that YUPELRI is not meant to relieve acute symptoms of COPD and extra doses should not be used for that purpose. Advise patients to treat acute symptoms with an inhaled, short-acting beta<sub>2</sub>-agonist such as albuterol. Provide patients with such medicine and instruct them in how it should be used.

Instruct patients to seek medical attention immediately if they experience any of the following:

- Decreasing effectiveness of inhaled, short-acting beta<sub>2</sub>-agonists
- Need for more inhalations than usual of inhaled, short-acting beta<sub>2</sub>-agonists
- Significant decrease in lung function as outlined by the physician

Tell patients they should not stop therapy with YUPELRI without healthcare provider guidance since symptoms may recur after discontinuation.

##### Paradoxical Bronchospasm

As with other inhaled medicines, YUPELRI can cause paradoxical bronchospasm. If paradoxical bronchospasm occurs, instruct patients to discontinue YUPELRI.

##### Worsening of Narrow-Angle Glaucoma

Instruct patients to be alert for signs and symptoms of acute narrow-angle glaucoma (e.g. eye pain or discomfort, blurred vision, visual halos, or colored images in association with red eyes from conjunctival congestion and corneal edema). Instruct patients to consult a healthcare provider immediately if any of these signs or symptoms develops.

##### Worsening of Urinary Retention

Instruct patients to be alert for signs and symptoms of urinary retention (e.g. difficulty passing urine, painful urination). Instruct patients to consult a healthcare provider immediately if any of these signs or symptoms develops.

##### Instructions for Administering YUPELRI

It is important for patients to understand how to correctly administer YUPELRI using a standard jet nebulizer [see Instructions for Use]. Instruct patients that YUPELRI should only be administered via a standard jet nebulizer. Patients should be instructed not to inject or swallow the YUPELRI solution. Patients should be instructed not to mix other medications with YUPELRI.

Patients should not inhale more than one dose at any one time. The daily dosage of YUPELRI should not exceed one unit-dose vial. Inform patients to use the contents of one vial of YUPELRI orally inhaled daily at the same time every day. Patients should throw the plastic dispensing vials away immediately after use. Due to their small size, the vials pose a danger of choking to young children.

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was 13.3 cm H<sub>2</sub>O) was associated with higher in-hospital mortality. There were also significant reductions in V<sub>t</sub> (from 6 to 4 mL/kg PBW), P<sub>plat</sub> values, and FiO<sub>2</sub>.

### Extracorporeal CO<sub>2</sub> removal

Extracorporeal CO<sub>2</sub> removal is similar to VV-ECMO but uses lower flows and a smaller catheter to remove solely CO<sub>2</sub>. Near apneic ventilation has been studied in conjunction with extracorporeal CO<sub>2</sub> removal. Iglesias et al<sup>10</sup> used a post pneumonectomy ARDS model in pigs to investigate the effect of near apneic ventilation in conjunction with extracorporeal CO<sub>2</sub> removal. They compared near apneic ventilation (V<sub>t</sub> 1-2 ml/kg PMW, RR 5-8 bpm, PEEP 15 cmH<sub>2</sub>O, driving pressure 5 cm H<sub>2</sub>O) to conventional lung protective ventilation (V<sub>t</sub> 6 ml/kg PBW, RR 15-20 bpm, PEEP 10-15 cmH<sub>2</sub>O, driving pressure 20 cm H<sub>2</sub>O) and found less lung injury in the near apneic group. Bein et al<sup>11</sup> performed a randomized controlled trial in 79 patients with moderate to severe ARDS to investigate the effect of using a V<sub>t</sub> of 3 ml/kg PBW with the aid of extracorporeal CO<sub>2</sub> removal, compared with conventional ventilator management of V<sub>t</sub> of 6 ml/kg PBW. The driving pressure was able to be reduced from 13 cm

H<sub>2</sub>O (conventional) to 8 cm H<sub>2</sub>O (smaller V<sub>t</sub> group). The results were a decrease in serum IL-6 (proinflammatory mediator) concentrations but there were no differences in any clinical outcomes. In perhaps a glimpse of the future for ARDS patients, Hoepfer et al<sup>12</sup> conducted a small, single-center, uncontrolled pilot trial designed to assess the feasibility of VV-ECMO in awake, non-intubated, spontaneously breathing patients with ARDS. Six patients were enrolled and four were successfully weaned from ECMO. The authors acknowledged that the patients in this series were highly selected and suffered only from single-organ failure and these results should not be extrapolated to ARDS patients with sepsis and multi-organ failure.

Potential complications of minimizing ventilator settings are surfactant dysfunction, atelectasis, and higher ECMO flows. Ventilation with very low lung volumes can result in surfactant impairment and atelectasis. Furthermore, dynamic shear stress has the potential to occur from cyclic collapse and reopening, however, effective use of PEEP may help prevent this.<sup>13</sup> When using the “maximal lung rest” approach, it is likely that ECMO support will have to be increased to the point

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that there is very little ventilatory contribution from the patient's lungs. This involves using higher ECMO flow rates, which carries the risk of higher shear forces in the ECMO circuit and may result in hemolysis and systemic inflammation.<sup>14</sup> The higher flow may also result in drainage insufficiency, which may require the placement of a larger-bore cannula which carries its own set of potential risks. Although the idea of being able to reduce ventilatory support to a bare minimum has appeal, clinicians must be aware of the complications associated with the lung itself as well as the higher ECMO flows. Balancing the benefit of minimal ventilator settings against the potential complications is a challenging endeavor and must be approached cautiously.

Finding the optimal ventilator management strategy for patients receiving VV-ECMO remains very challenging. The prospect of being able to push the lung-protective envelope even further by using lower than conventional  $V_t$ ,  $P_{plat}$ , and driving pressures is very enticing. The best available evidence indicates that conventional lung protection should be used. Although minimizing ventilator-induced lung injury is vital, the potential benefit of maximal lung rest during ECMO must be balanced against the potential risks of higher ECMO support that accompany this strategy. More well-designed studies are needed to evaluate different ventilator management strategies in patients with ARDS who are being treated with VV-ECMO. ■

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## Sleep Waves

# Hypoglossal Nerve Stimulation as a Treatment for Obstructive Sleep Apnea

by Meena Khan, MD, and Madelyn Rosenthal, MD

Obstructive sleep apnea (OSA) is an increasingly common condition characterized by intermittent collapse of the upper airway, mainly behind the tongue and soft palate, during sleep. The events are characterized by complete collapse (i.e., apnea) or partial collapse (i.e., hypopnea). Continuous positive airway pressure (CPAP) remains the gold standard treatment for OSA, and this therapy has been shown to improve daytime sleepiness and quality of life. However, the effectiveness of CPAP therapy is dependent upon patient tolerance and adherence. The nonadherence rate for CPAP, which is defined as less than 4 hours of nightly use, has been reported to be 46–83%.<sup>1</sup> As a result, patients seek alternative therapy options, such as oral appliances and various upper airway surgeries, all of which have varying degrees of success. In 2014, the Food and Drug Administration approved the Inspire device, a hypoglossal nerve stimulator (HNS) manufactured by Inspire Medical Systems (Golden Valley, Minnesota), as a treatment option for individuals with moderate to severe OSA who cannot tolerate CPAP.

In the late 1970s, various studies demonstrated that oropharyngeal occlusion resulted, in part, from reduced genioglossus muscle activity, which is an extrinsic tongue muscle principally responsible for tongue protrusion.<sup>2</sup> This knowledge spurred efforts to treat OSA with direct muscle stimulation via transcutaneous, intraoral, and intramuscular electrodes. Unfortunately, these stimulation

techniques resulted in frequent arousals from sleep, and it was unclear whether the resolution of airway obstruction resulted from direct muscle stimulation or arousals thought to be due to sensory stimulation.<sup>2-4</sup> Early animal studies suggested that genioglossus stimulation resulted in improvements in airway patency secondary to the muscles stiffening and dilating effects, which suggested that it could be a potential targeted treatment for OSA.<sup>5-6</sup>

Previous attempts at direct muscle stimulation were not successful, however, so the focus shifted to stimulation of the hypoglossal nerve, which innervates the genioglossus muscle. Additionally, the hypoglossal nerve has limited sensory feedback, which would have the benefit of decreasing the amount of potential patient discomfort.<sup>7</sup> Currently, the Inspire device is the only HNS that is FDA-approved for the treatment of OSA. The device is made up of three components: a stimulation lead placed on the hypoglossal nerve; an implantable pulse generator inserted on the right side, which leaves the left side clear in case the patient requires a cardiac pacemaker or cardioverter-defibrillator; and a respiratory sensing lead. The cuff of the stimulation lead is wrapped around the distal hypoglossal nerve. Cuff placement is important because stimulation of

the proximal hypoglossal nerve results in activation of both the tongue protrudors (genioglossus) and re-

### about the authors...



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tractors (styloglossus and hypoglossus), whereas distal stimulation only activates the protrudors.<sup>8-10</sup>

The stimulator device is activated by an external remote control that the patient can use to turn therapy on and off. The remote control also allows the patient to increase or decrease the amplitude or strength of stimulation within a certain range that is programmed into the device by the patient's sleep medicine provider. Patients are instructed to activate the device when getting in bed to go to sleep. Various programmable settings are available to tailor the device to a patient's specific needs, including a delay while the patient falls asleep, sleep duration, and pause time. Stimulation settings are titrated during an overnight laboratory polysomnogram to reach a therapeutic level. The respiratory sensor synchronizes hypoglossal nerve stimulation with inhalation to induce tongue protrusion and thus increase the anterior-posterior diameter of the upper airway, thereby decreasing the frequency of obstructive apneas and hypopneas.<sup>3-6</sup>

In 2014, the landmark paper was published by the Stimulation Therapy for Apnea Reduction (STAR) trial group.<sup>11</sup> It was a multi-center study that included 126 participants with moderate to severe OSA and difficulty tolerating PAP therapy. The primary outcome measures were a reduction in the apnea-hypopnea index (AHI) by 50% from the baseline score, with a post-treatment AHI <20, and a 25% reduction in the oxygen desaturation index (ODI). At one year, the median AHI decreased from 29.3 events/hour to 9 events/hour (a 68% decrease), and the median ODI decreased from 25.4 events/hour to 7.4 events/hour (a 70% decrease). Furthermore, 66% of the participants (83 patients) met the AHI primary outcome measure, and 75% met the ODI primary outcome measure. Secondary outcome measures of quality of life, assessed with the Functional Outcomes of Sleep Questionnaire (FOSQ), and sleepiness, assessed with the Epworth Sleepiness Scale (ESS), both had a statistically significant improvement as compared to baseline. Five-year outcome data were published on 97 of the 126 subjects, and 71 of those had polysomnogram data.<sup>10</sup> Of those who did not complete the five-year follow-up, 21 were lost to follow-up, five died of unrelated causes, and three had the device removed. Those who did not complete the five-year follow-up had a higher baseline AHI and ODI values and lower FOSQ scores compared to those who did complete the follow-up. Of those who had a repeat polysomnogram at five years, 75% had an AHI

reduction of >50% and AHI <20 compared to baseline. The improvements in FOSQ and ESS scores were maintained at five years as well.

In 2018, The Adherence and Outcome of Upper Airway Stimulation for OSA International Registry (ADHERE registry) published data on 301 patients with the Inspire device. ADHERE is a multi-center registry of patients implanted with HNS in the United States and Germany.<sup>12</sup> Results showed a mean AHI decrease from a baseline of  $35.6 \pm 15.3$  events/hour to  $10.2 \pm 12.9$  at post-titration ( $P < .0001$ ) with a median decrease from 32.5 to 5.5 events per hour. The absolute AHI reduction from baseline was  $-25.3 \pm 16.4$  events/hour (and a relative reduction of  $71\% \pm 34\%$ ). The ESS also decreased significantly from  $11.9 \pm 5.5$  at baseline to  $7.5 \pm 4.7$  at post-titration ( $P < .0001$ ). Average home device usage was  $6.5 \pm 2.3$  hours per night (95% CI 6.1–6.9) with a median use of 46 hours per week. The clinical global impression scale showed that 94% of physicians rated improvement in patient's OSA compared to baseline.<sup>12</sup>

Not many adverse events are reported with HNS. The most common complaint is discomfort due to electrical stimulation; this complaint occurs most frequently during the first year of therapy and improves with adjustments to the stimulation settings.<sup>10</sup> Another common complaint is tongue abrasion, which improved over time with device reprogramming or with the use of a bite guard. Other complaints include numbness, lip weakness, change in salivation, abnormal sensations, or insomnia/arousals, which improve over time. Postoperative complications include seromas and submandibular swelling, which resolved without sequelae.<sup>10-11</sup> Serious complications are rare but include repositioning or replacement of the stimulation or sensing leads due to issues with therapy or comfort.<sup>10</sup> Another important consideration when evaluating patients for HNS implantation is that a patient with this device cannot have thoracic, shoulder, or abdominal magnetic resonance imaging.

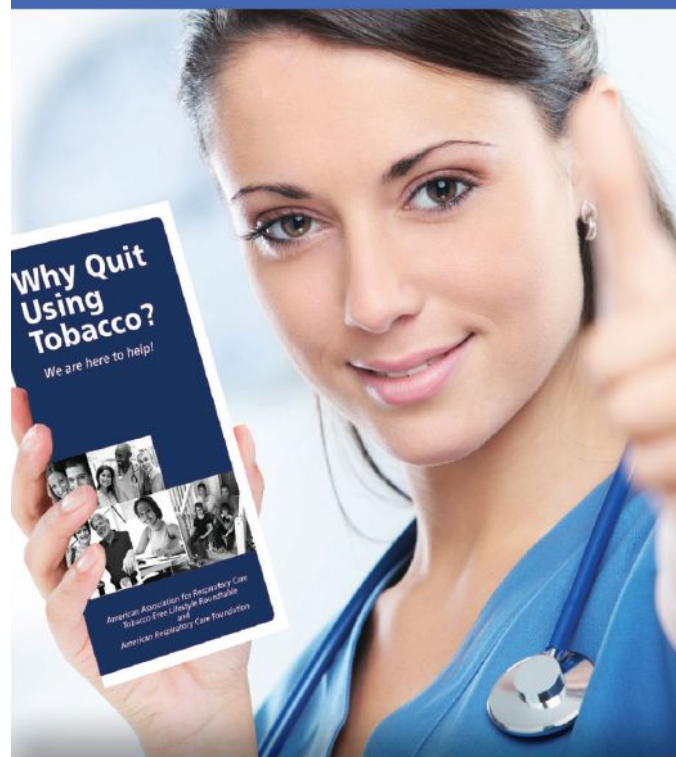
There are strict criteria to screen for patients for whom HNS may be a suitable therapy: moderate to severe OSA (i.e., AHI 15–65 events/hour) with <50% of events being central apneas; age  $\geq 22$  years; body mass index  $< 32$  kg/m<sup>2</sup>; failure of or inability to tolerate PAP therapy; and absence of concentric collapse at the level of the velopharynx during the during a drug-induced sleep endoscopy.

The HNS provides an innovative treatment option for patients with moderate to severe OSA who fail PAP therapy or are unable to tolerate PAP therapy. When implanted in the appropriate candidate, HNS provides effective treatment for OSA. Studies show a 68% reduction in AHI, improvement in subjective evaluations of sleepiness and quality of life, and good adherence in most patients. Adverse events are typically temporary and are often related to stimulation discomfort, which can be resolved by adjusting the stimulator settings. ■

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# RC Currents

IN THE NEWS

## Contribute to the AARC “Transitions” Column

The AARC “Transitions” column is devoted to sharing news about the passing of AARC members. You can submit news about your colleagues’ recent passing by going to <http://c.AARC.org/transitions>. Please provide any information about the member’s recent death, such as an obituary, so that we can share it with our members and pay tribute. ■



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Every therapist has a story to tell about a favorite or most memorable patient that would interest others in the profession. Maybe it was an “aha moment” when you knew you had made the right professional decision for that patient. Maybe it was when you first realized how much difference you were making in the lives of that patient and his family. Or maybe it was just something the patient said or did that made you laugh or cry or just be inspired to be a better RT. Our “Storytellers” column is the place to share these stories. Send your story to AARC via this URL: [https://c.aarc.org/members\\_area/aarc\\_times/pay\\_it\\_forward/](https://c.aarc.org/members_area/aarc_times/pay_it_forward/) ■



## Enzyme May Promote Fibrosis in Rare Lung Disease

Hermansky-Pudlak syndrome is a rare hereditary disease that can lead to lung fibrosis. Researchers from Thomas Jefferson University have identified the role that enzymes known as matrix metalloproteinases (MMPs) may play in that process.

MMPs typically remove the extracellular matrix, a scaffold that holds the cells in body tissues together, when that scaffold is no longer necessary. However, they are often altered in lung diseases, where a shakier scaffold can cause rigidity and inflammation in the surrounding tissue.

In this study, the investigators examined whether MMP activity was altered in lung tissue affected by Hermansky-Pudlak syndrome and how these changes were connected to the onset of pulmonary fibrosis. Results indicated that certain subsets of MMPs were increased in the lungs of mouse models of the disease, as well as in fluid collected from the lungs of patients with Hermansky-Pudlak syndrome. In both mouse models and patient samples, MMP was detectable at high levels prior to the development of fibrosis, indicating that high levels of MMP may be associated with onset rather than progression of the disease.

The study was published in a recent edition of *Orphanet Journal of Rare Diseases*. ■

## Ann & Robert H. Lurie Children's Hospital Respiratory Care New Graduate Residency Program

by Emilee Lamorena, MSc, RRT, RRT-NPS

Starting a career in neonatal-pediatric respiratory care can be intimidating, especially for new graduates. The RT New Graduate Residency at Ann & Robert H. Lurie Children's Hospital in Chicago, IL, was designed to provide extra support and training to recent graduates as they prepare to transition into their first jobs. In addition to receiving additional one-on-one precepted clinical training in our NICU, CCU, PICU, and acute care areas, the RT residents complete 64 hours of didactic work that covers essential topics such as neonatal and pediatric anatomy and physiology, disease pathophysiology and management, ventilator management, pharmacology, ECMO, cardiac anomalies, cardiopulmonary interactions of mechanical ventilation, and much more.

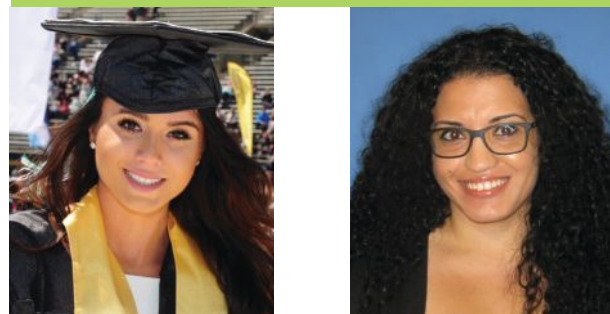


Emilee Lamorena, MSc, RRT, RRT-NPS, believes the residency program gives new grads the confidence they need to work in neonatal-pediatric respiratory care.

the unit where they are training. Their clinical training is further augmented with extensive hands-on equipment labs and simulation-based competencies. The structure of the program allows the RTs to learn complex concepts and apply them immediately at the bedside.

The last step of the residency is the completion of a year-long Evidence-Based Practice (EBP) Project. During the EBP process, the residents perform an extensive research review to critically evaluate current respiratory therapy practices at Lurie Children's. They present their findings and recommendations for clinical care to senior leadership of the hospital in a large poster forum. This past April, graduates of the 2017 residency presented their project, "In-line suctioning vs. closed

One of the most unique features of the residency is the multidisciplinary approach to the training. The classes are taught not only by respiratory therapists, but by members of all of the disciplines and specialists they will be working next to in the units — attending physicians, fellows, APNs, RNs, child life specialists, pharmacists, and more. The classes are strategically aligned so that the RTs learn about the diseases, management strategies, and clinical considerations specific to



Alexandra Domoras, left, and Tara Morris appreciate the experience they gained during the Lurie Children's residency program.

suctioning: What is best practice?" and will begin working with the medical directors to drive quality and practice improvement in our units.

According to Alexandra Domoras, BS, RRT, RRT-NPS, the residency helped her grow and better herself as a respiratory therapist. "It's the perfect balance of having guidance when you need it but also getting the autonomy that allows you to make decisions on your own," she says. "I felt very confident in my skills after completing this program!"

Other residents believe the program has helped ease their transition into a new career in a city new to them. According to Tara Morris, AS, RRT, RRT-NPS, when she first started, "scared" was an understatement. "This program allowed me to work closely with very respected clinicians, and provided me with the knowledge, critical thinking skills, and confidence to become the best version of myself, both clinically and personally," she says.

Graduates of the program have continued to invest in their professional development by attaining their RRT-NPS credential, becoming charge therapists, training for the ECMO team, and more. As a result of the RT residency, new graduate respiratory therapists are more confident, clinically competent, and critically-thinking clinicians at the bedside, ready to thrive in rapidly changing and fast-paced environments as they begin their new careers. ■

*Emilee Lamorena is a clinical manager of respiratory care and the residency coordinator for the RT New Graduate Residency at Ann & Robert H. Lurie Children's Hospital in Chicago, IL.*



## Dual Burden Births

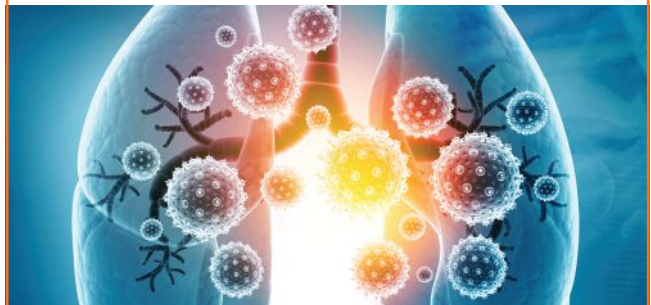
Neonatal-pediatric RTs play an integral role in the care of premature infants. According to U.S. researchers publishing in the *Journal of Maternal-Fetal & Neonatal Medicine*, they and their colleagues in the neonatal ICU need to realize that, in about a quarter of such cases, the infant’s mother is suffering from serious maternal complications as well.

These “dual burden” births were investigated by looking at all California births from 2007 through 2012, which totaled 3.1 million. The rate of preterm birth was 876 per 10,000 births, and the rate of severe maternal morbidity was 140 per 10,000 births. About 25% of the women with severe maternal morbidity also had their babies prematurely; 61% of these births occurred in cases of preterm labor, and 23% occurred in cases where the baby needed to be born early for medical reasons. Higher risks for “dual burden” birth were seen in mothers who required cesarean birth, were carrying multiples, had a history of smoking during pregnancy, were underweight, had high blood pressure, and had diabetes. After controlling for other factors, black women were twice as likely to have a “dual burden” birth as white women. ■

## IVACAFTOR MAY REDUCE INFECTIONS IN CF

British researchers publishing in a recent edition of the *Annals of the American Thoracic Society* have reported that the drug ivacaftor can reduce the number of respiratory infections suffered by people with cystic fibrosis (CF).

The study was based on data from a CF registry in the United Kingdom. The three-year trial compared CF patients age six and older who took ivacaftor, which is typically prescribed to patients whose disease is caused by a particular mutation, with similar patients who did not take the drug. Ivacaftor was associated



with a 32% reduction in the number of people infected with *Pseudomonas aeruginosa* and a 15% reduction in *Staphylococcus aureus*. These reductions resulted from both increased clearance of the infection in those already infected and in reduced acquisition in those not infected. Ivacaftor was also associated with reduced *Aspergillus spp.* infections but did not appear to reduce *Burkholderia cepacia* complex infections.

The authors call for more study to confirm these findings, but they suggest that treatment with ivacaftor may one day allow some patients with CF to discontinue some of the other medications they are on that target these same infections. ■



## Estrogen Is Linked to Flu-Vaccine Response

In a study that evaluated responses to the flu vaccine in 50 adults 18-45 years old and 95 adults age 65 years and older, researchers from the Johns Hopkins University Bloomberg School of Public Health found that women in the younger group had a stronger immune response compared to older women and men. Why? Estrogen may be the deciding factor. In experiments in mice, the investigators concluded that estrogen boosts the immune response to flu vaccines in females, whereas testosterone lowers it in males. “What we show here is that the decline in estrogen that occurs with menopause impacts women’s immunity,” said study author Sabra Klein, PhD. “We need to consider tailoring vaccine formulations and dosages based on the sex of the vaccine recipient as well as their age.” The study appeared in a recent edition of *NPJ Vaccines*. ■

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## BE CAREFUL WHAT YOU WISH FOR?



Health officials agree that young people should be dissuaded from smoking e-cigarettes. But laws aimed at curtailing the availability of these products among youth may have an unintended effect, report researchers from Duke Health. In a survey of 240 young U.S. adults who use both e-cigarettes and traditional tobacco cigarettes, 47% said if regulations eliminated the nicotine in e-cigarettes, they wouldn't use e-cigs as much and would increase their use of traditional cigarettes. About 22% said if regulations limited the customizability of devices, such as allowing users to adjust the nicotine dose or vapor temperature, they would use e-cigs less and smoke more tobacco cigarettes. And around 17% said if e-cigarettes were limited to tobacco and menthol flavors, they wouldn't use e-cigs as much and they would smoke more tobacco cigarettes.

"It's likely some potential new regulations on e-cigarettes will result in a net good for the whole population, such as limiting flavors that might entice young users, improving safety standards, or mandating that liquids come in child-proof containers," said study author Lauren Pacek, PhD. "However, our findings suggest that there should also be thoughtful consideration to potential unintended consequences that could affect other subsets of users of e-cigarettes and other tobacco products."

The research appeared in *Substance Use & Misuse* earlier this year. ■

## Handout Improves Pediatric Flu Vaccination Rate



Getting kids vaccinated against the flu can be an uphill battle. Researchers from Columbia University have found that a handout with information about the flu and flu vaccinations can help.

The study included 400 parent-and-child pairs at pediatric clinics in northern Manhattan. The parents answered a brief questionnaire to assess their attitudes toward the flu shot and their intent to vaccinate. Then a third of the group received a one-page handout with local information about the flu, another third received a one-page handout with national information about the flu, and the rest were not given a handout. Nearly 72% of children whose parents were given either fact sheet were vaccinated before the end of the season compared to around 65% of those who did not receive a handout. The study was published in a recent edition of *Pediatrics*. ■

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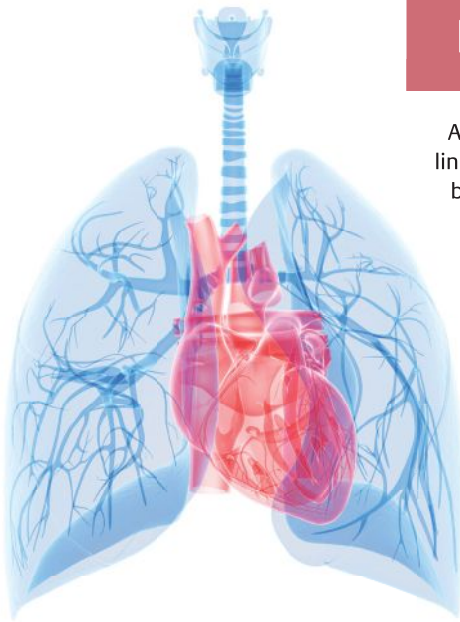


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## NEU1 Enzyme Linked to Pulmonary Fibrosis

A new study out of St. Jude's Children's Research Hospital has linked a deficiency in the enzyme neuraminidase 1 (NEU1), which breaks down sugar-containing molecules in many cells of the body, to the development of fibrosis in organs ranging from the kidneys to the lungs. When the investigators examined tissue from adults with idiopathic pulmonary fibrosis, they found NEU1 production was significantly reduced as compared to adults without the diagnosis. "This is the first time NEU1 has been associated with fibrotic conditions," said corresponding author Alessandra d'Azzo, PhD. "Based on these findings, it is tantalizing to hypothesize that NEU1 expression levels may help identify individuals at risk for fibrosis or inform their prognosis, particularly when information about the cause or possible treatment is lacking." The study appeared in *Science Advances* earlier this year. ■

## Court-Ordered Anti-Smoking Ads Fall Short



The tobacco settlement reached between the tobacco companies and the courts in 2006 mandated anti-smoking advertisements. A new study from investigators at the University of Texas MD Anderson Cancer Center has found those court-ordered ads are falling short when it comes to reaching people who most need to be educated about the dangers of smoking.

The researchers assessed data from the 2018 Health Information National Trends Survey, a nationally representative, population-based cross-section survey of U.S. adults sponsored by the National Cancer Institute. The study analyzed responses from 3,484 adults, including 450 current smokers, on their self-reported exposure to the anti-smoking advertisements.

Overall just 40.6% of U.S. adults and 50.5% of current smokers in 2018 were exposed to the ads. Exposure was lowest among adults 18–34 years old (37.4%), those with a high-school or lower education (34.5%), and those with a household income less than \$35,000 (37.5%). Among current smokers, exposure was lowest in the Hispanic population, at just 42.2%. The study was published in a recent edition of *JAMA Network Open*. ■

## Menthol Makes It Harder for African-Americans to Quit Smoking



It's no secret the tobacco industry has marketed menthol cigarettes specifically to African-American communities. U.S. researchers who combined the results of 19 previous studies on the association between menthol use and smoking cessation suggest that this tactic is helping those companies hang on to African-American smokers. Results showed black smokers who prefer menthols are 12% less likely to quit smoking compared to non-menthol users. Since that finding was not seen in smokers across the board, the researchers conclude tobacco company marketing is probably to blame and suggest that banning menthol in tobacco products could help.

"It all comes down to power and who has more of it and who has less of it, and why," said study author Philip Smith, from Miami University. "Such a policy might effectively take some power away from the tobacco industry and give it back to African-Americans in the U.S." The study was published in *Nicotine & Tobacco Research* earlier this year. ■

## Strange but True...

**Get slimed!** British researchers believe small proteins in the mucus of the brown garden snail may open the door to new treatments for people with cystic fibrosis. The proteins have antimicrobial properties and were able to prevent the growth of various strains of *P. aeruginosa* in lab tests and in bacterial samples taken from patients with CF.



### Social media sleuths:

Investigators from Stony Brook University have found that Facebook posts can predict 21 common diseases. They reached that conclusion after analyzing about 20 million words used in the posts of 999 people who consented to share their posts. For 10 of the 21 conditions, the posts alone were better at predicting the diseases than a combination of the posts and demographic information.

**A new future for tobacco plants?** Cornell researchers have for the first time been able to grow tobacco plants in the field that are engineered to produce non-native proteins intended for medical and industrial use. Right now these proteins are grown in large, expensive fermenting reactors. Growing them outdoors in normal fields could make them three times less expensive to produce. ■





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Since 1947, the AARC has been leading the effort to advance the science and practices of the respiratory care profession while promoting the highest quality of care for our patients. Collaborating with the respiratory communities at-large, we have successfully advocated at the federal, state and local level for patients, their families, the community, the profession and the respiratory therapist.

The collaborative efforts between the respiratory care profession and manufacturers in pursuing unique

and innovative ways to improve both the quality and outcomes of our patients makes us natural partners in today's ever changing health care continuum.

As health care finances become more strained and patient care becomes increasingly more complex, the mutual challenges become greater for the profession and its industry partners. The inherent synergies of the corporate partner concept are to provide an effective and efficient way to address those needs utilizing our combined skills and resources.





## Industry Watch

### Respiratory therapist in a box

Strados Labs is working on a device consisting of a noninvasive sensor that can be worn on the chest or back to collect continuous data on lung function and other factors, allowing health care providers to monitor a patient's condition in real time. The device, which is being dubbed "respiratory therapist in a box," is currently being tested at three sites and is initially expected to be offered for use in patients with COPD. The company plans to file an FDA clearance application for the device by the end of 2019.

### Prehospital Airway Control Trial gets underway

The University of Pittsburgh School of Medicine and the University of Pittsburgh Medical Center will lead nearly two dozen emergency medical service (EMS) agencies across the country in a clinical trial funded by the Department of Defense and aimed at improving survival among people who have difficulty breathing after a trauma. The Prehospital Airway Control Trial is an \$8.8-million, four-year study that will compare endotracheal intubation with the use of supraglottic devices to see if one leads to better survival than the other when applied at the scene of a trauma. Participating EMS services will start

by using their normal procedures to secure an airway, and the trial will collect data on patient outcomes. Then the services will switch to trying a supraglottic airway first. If it fails, they can then decide whether to try a supraglottic device again or switch to endotracheal intubation.

### Study to explore reasons for the rise in black lung disease

The rate of severe coal workers' pneumoconiosis — also known as black lung disease — has been on the rise recently despite regulations on exposure to dusts associated with mining. A new \$750,000 grant from the Alpha Foundation for the Improvement of Mining Safety and Health will support researchers from the University of Illinois at Chicago (UIC) Mining Education and Research Center, who are working to find out how various mining dusts contribute to lung disease. "We know that coal and silica dusts increase the risk for development of black lung disease, but we don't know much about how mixtures behave and what combinations are worse for lung health," said Dr. Leonard Go, assistant professor of environmental and occupational health sciences at UIC and an investigator on the grant. "We want to be able to create 'mine dust risk profiles' for pulmonary disease that can be used to inform policy

and improve regulations limiting exposure to these dusts."

### COPD/OSA overlap syndrome study gets underway

David Geoffrey Chapman, BSc, PhD, from the University of Technology in Sydney, Australia, has been awarded the new ATS Foundation/ResMed Research Fellowship in Sleep-Disordered Breathing and PAP Therapy. The \$100,000 award will support his research into how non-invasive ventilation (NIV) can help improve sleep for people with COPD/OSA overlap syndrome. The study will specifically aim to determine how effective various NIV settings are in addressing hyperinflation, which reduces the function of the diaphragm and is correlated to reduced sleep quality. "Through ResMed's support, this new award will provide a much-needed source of funding for scientists such as Dr. Chapman to determine how to best treat sleep-disordered breathing in patients with COPD in order to improve their lives," said Sanjay Patel, MD, chair of the ATS Assembly on Sleep and Respiratory Neurobiology.

### Circassia Pharmaceuticals awarded group purchasing agreement

Circassia Pharmaceuticals, Inc., has been awarded a group

purchasing agreement for pulmonary function and metabolic analyzers with Premier. The new agreement allows Premier members, at their discretion, to take advantage of special pricing and terms prenegotiated by Premier for NIOX® asthma diagnosis and management devices. "One of Circassia's primary goals is improving access to NIOX for the millions of Americans who suffer from asthma, and therefore it is extremely gratifying to be awarded this prestigious agreement with Premier," said David Acheson, senior vice president of U.S. Commercial at Circassia. "This new contract will provide Circassia with a straightforward route to serve Premier members as potential new customers, helping us expand our accounts while offering savings opportunities for NIOX users."

### U.S. universities team up with the TB Alliance on new treatments for tuberculosis

Several U.S. universities are among those teaming up with the TB Alliance, a nonprofit organization dedicated to the discovery, development, and delivery of new tuberculosis cures, to help find new drug treatments for tuberculosis. The five-year research project will receive up to \$28.4 million in funding through the Centers of Excellence for Translational Research program, which is supported by the National Institute

of Allergy and Infectious Diseases. Key partners on the project include the University of Illinois at Chicago, Harvard University, Johns Hopkins University, Princeton University, Texas A&M University, Myongji University, and Eli Lilly.

### Major growth seen in telehealth provided by those outside of the hospital setting

According to “A Multilayered Analysis of Telehealth – A FAIR Health White Paper,” which was released in July, private insurance claim lines for non-hospital-based provider-to-patient telehealth grew 1,393% between 2014 and 2018. Claim lines for these services increased 1,227% in urban areas and 897% in rural areas. In 2018, non-hospital-based provider-to-patient telehealth accounted for 84% of all telehealth claim lines, compared with 52% in 2014. The top three reasons individuals sought treatment from a provider via non-hospital-based telehealth were acute upper respiratory infections, mood (affective) disorders and anxiety, and other nonpsychotic mental disorders. The study drew on data from FAIR Health’s comprehensive repository of more than 29 billion private health care claim records.

### Influenza vaccine maker names new executive vice president

CSL Limited has named Anjana Narain as executive vice president and general manager of its Seqirus business, one of the world’s largest influenza vaccines providers. She will replace Gordon Naylor, who announced his retirement earlier this year. “In leading Seqirus, Anjana brings diverse,

broad-based experience as a well-established global industry leader,” said Paul Perreault, CSL CEO and managing director. “Anjana has focused on protecting public health throughout her career, which will be important in continuing to advance Seqirus’ differentiated technologies and further grow its market reach.” Narain brings 27 years of experience with major pharmaceutical companies such as GlaxoSmithKline, Merck, and Bayer to the position.

### PFF adds new sites to Care Center Network

The Pulmonary Fibrosis Foundation (PFF) has added eight new sites to its Care Center Network to help serve the more than 200,000 Americans living with pulmonary fibrosis. Sixty-eight medical centers nationwide now offer expertise in accurately diagnosing and treating people with pulmonary fibrosis. “Our growing network of centers has expanded to the states of Indiana, Nebraska, Oregon, and Vermont, increasing coverage in new geographic regions,” said Pauline Bianchi, PFF vice president of research and development. “Our goal is to continue to expand access to ultimately bring comprehensive care and expertise to more people living with this life-threatening condition.” The new sites include Creighton University in Omaha, NE; Emory University Hospital in Atlanta, GA; Indiana University Health in Indianapolis, IN; New York University School of Medicine in New York, NY; The Oregon Clinic in Portland, OR; The University of Vermont Medical Center in Burlington, VT; Thomas Jefferson University Hospital in Philadelphia,

PA; and the University of Kentucky Research Foundation in Lexington, KY.

### CF drug receives Orphan Drug Designation in Europe

According to Aridis Pharmaceuticals, Inc., the European Medicines Agency (EMA) has granted Orphan Drug Designation to AR-501, the company’s inhaled formulation of gallium citrate for the treatment of lung infection in patients with cystic fibrosis. Aridis received Orphan Drug Designation for AR-501 from the FDA for the same condition in June 2019. “Receiving orphan designation from the EMA for AR-501 is an important step in ensuring the program is well positioned from a global regulatory development pathway standpoint as we continue to advance its ongoing Phase 1 / 2a clinical trial,” said Aridis CEO Vu Truong, PhD. “We remain on track to report data from the Phase 1 segment of the trial consisting of healthy subjects in Q1 2020 and the Phase 2a portion with cystic fibrosis subjects in Q2 2021.”

### New AI technology aims to improve lung biopsy

RSIP Vision, a global leader in artificial intelligence (AI), computer vision, and image-processing technology, has released an advanced AI lung-segmentation module that reduces the threat of false positives in biopsies. The new solution delivers superior mapping of even the smallest airways, ensuring surgeons can navigate to precise locations and biopsy the correct area. By optimizing navigation and providing the clearest possible view of the lungs, the AI module

enables more accurate results with minimal intervention, while avoiding damage to the border of the lungs. “We’re offering this technology to the medical device industry as an absolutely necessary solution for navigation,” RSIP Vision Founder and CEO Ron Soferman says. “Today we’re seeing new players in the market using advanced technologies, sometimes with robotic assistance and infrastructure. For them, as for everyone in the industry, having the best possible airway segmentation is a vital element in the success of any procedure.”


### Data on phrenic nerve stimulation device published

According to Respicardia, Inc., manufacturer of the only FDA-approved active implantable device for the treatment of central sleep apnea (CSA), 24- and 36-month data from the remedē® System Pivotal Trial has been published by the peer-reviewed journal SLEEP. The results demonstrate long-term safety and sustained improvement in sleep metrics from phrenic nerve stimulation in adult patients with moderate to severe CSA through 36 months of remedē System therapy. “It is imperative that we understand the long-term results of phrenic nerve stimulation since CSA and its underlying disorders are chronic and progressive,” said Henrik Fox, MD, senior cardiologist at Ruhr-Universität Bochum in Bad Oeynhausen, Germany. “The durability of the clinical results seen in this trial further validates the remedē System as an effective, reliable, long-term treatment option for indicated patients.”

# Industry Update

Featuring information on products and equipment from manufacturers

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Dunne R et al. Aerosol dose matters in the Emergency Department: A comparison of impact of bronchodilator administration with two nebulizer systems. Poster at the American Association for Respiratory Care, 2016.

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# Calendar of Events

## AARC & State Society Programs

**October 8, 2019**

**Newark, DE**

Delaware Society for Respiratory Care 26th Annual Trends in Respiratory Care

Contact: dsrc@gmail.com or <http://www.delawarelung.org>

**October 10–11, 2019**

**Plainfield, IN**

Respiratory Therapist: The Building Blocks of Healthcare

Contact: susan.vontobel@gmail.com or <http://www.in-ISRC.org>

**October 9–11, 2019**

**Atlantic City, NJ**

NJSRC Shore Conference

Contact: education@njsrc.org or <http://www.education@njsrc.org>

**October 14, 2019**

**Roanoke, VA**

Mountain Air Symposium

Contact: b.brooks233@gmail.com or [www.vsrc.org](http://www.vsrc.org)

**October 21–26, 2019**

National Respiratory Care Week

Contact: <https://aarc.org/go/rc19>

**October 28–29, 2019**

**Sioux Falls, SD**

SDSRC 2019 Annual Conference

Contact: <https://static1.squarespace.com/static/5c3bbd79365f02e708cb032b/t/5d541f7456b652000164d830/1565794164992/19ConferenceFlyer.pdf>

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