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RESPIRATORY THERAPY IS HERE

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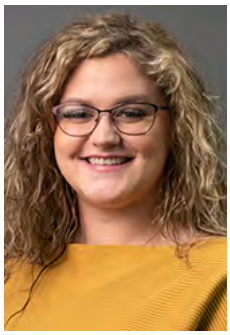
Anne Marie Hummel
Associate Executive Director
anneh@aarc.org
Anne Marie oversees state and federal legislative and regulatory issues impacting respiratory therapists, the RT profession, and the pulmonary patient.

Grady Peters
Systems Administrator
grady.peters@aarc.org
Grady maintains servers, workstations, and networks in the AARC office.



Emily Marco
Receptionist
emily.marco@aarc.org
Emily manages the front desk and helps members find the right support at the executive office.

Shawna Strickland
Associate Executive Director
shawna.strickland@aarc.org
Shawna manages our education, customer service, and membership departments.

Your AARC Times Team

Communications Manager
Heather Willden, BS

Managing Editor
Douglas Laher, MBA, RRT, FAARC

Contributors
Debbie Bunch, BA

Manager of Marketing and Production
Amanda de Coster, BA

Senior Graphic Designer
John Knotts

Graphic Designer
Anna Patiño

Director of Business Development
Sarah Vaughn, BS, RRT

Advertising Rates and Media Information
Contact: sarah.vaughn@aarc.org
9425 MacArthur Blvd., Suite 102
Irving, TX 75063
Voice (972) 243-2272
Fax (888) 206-9006

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Daedalus Enterprises, Inc.
9425 N. MacArthur Blvd., Ste. 100
Irving, TX 75063
Voice (972) 243-2272
Fax (972) 484-2720

Publisher
Thomas J. Kallstrom, MBA, RRT, FAARC

Information Contacts

AARC Membership or Other AARC Services: American Association for Respiratory Care • 9425 N. MacArthur Blvd., Ste. 100, Irving, TX 75063 • (972) 243-2272 • Fax (972) 484-2720 • www.aarc.org

Respiratory Therapist Credentialing & Registration: National Board for Respiratory Care • 18000 W. 105th St., Olathe, KS 66061-7543 • (913) 895-4900 • Fax (913) 895-4650 • www.nbrc. org

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COVID-19: Respiratory Therapy Is Here

by Carl Hinkson, MS, RRT, RRT-ACCS, RRT-NPS, FAARC

Let me give you a firsthand account of our experience so far in dealing with the novel coronavirus pandemic. On January 21, 2020, the Centers for Disease Control and Prevention (CDC) announced that the first patient diagnosed with the novel coronavirus was admitted to Providence Regional Medical Center in Everett (PRMCE), which is located in Washington state.[1] The patient was admitted to the hospital's special pathogens unit. Per the CDC guidelines, PRMCE is an assessment center for patients with unique or highly infectious diseases. The patient's course was well described elsewhere and was discharged two weeks later. During this time, we thought the impact of the COVID-19 virus would be minimal because the patient was appropriately isolated and community spread had been stopped. Little did we realize the true magnitude of what we would soon be facing and how we as respiratory therapists would play a prominent role.

Shifting focus, from assessment to treatment

I became aware that we would change from caring for a single patient to caring for many patients during my usual meeting with my executive director. I was informed that PRMCE would no longer just be an assessment center, but now would be considered a treatment center for patients with COVID-19. The thought behind this change was that personal protective equipment (PPE) required with COVID-19 was not as involved as something like Ebola, and that there may be more patients than two treatment centers in Washington state could handle.

There was now a possibility that a patient with COVID-19 could be admitted to our ICU and placed on a ventilator. I met with the RTs shortly after that meeting with my executive director to inform them of this change and the reasons. PRMCE respiratory therapists had not previously trained in extensive donning and doffing techniques of PPE, so becoming a treatment center for COVID-19 meant that they needed to complete some "just in time" training on donning and doffing of PPE. The RT staff were ready and willing to meet this new challenge.

Darryl Keffer, RRT, a senior staff member and PHIL award recipient, was able to share his experience caring for other patients with infectious diseases. This put newer staff at ease. From that conversation, we started preparing for the care of patients with COVID-19.

Patient surge

We did not realize how quickly things would escalate. The first true indication of the magnitude of the influx came from my wife just the day after I informed the RTs. For context, my wife is a nursing med-surg educator at PRMCE. She received a phone call on a Saturday afternoon asking her to report to work; they needed her to begin training on PPE right away. That was at 2 p.m. in the afternoon, and she did not return home until 8 a.m. the next morning. By Monday morning I had learned that the surge of patients with COVID-19 was substantial as the hospital incident command center had been "stood up." A steady flow of patients, who were referred to as persons of interest (POI), were being admitted as "rule out" had begun.

Modifying our behavior

The volume of POI began to rise steadily. The first obstacle from an organizational standpoint was the time required to obtain results of the COVID-19 testing swabs. At first it was taking 4–5 days to receive results telling us whether patients were infected with the COVID-19 virus. Every patient was placed in isolation once COVID-19 was suspected. This meant that even if a patient was not infected with the COVID-19 virus, we were treating them as if they were for days, thus consuming several days' worth of PPE while awaiting the results. As it turns out, this had consequences later. During this time, I took multiple shifts as the hospital incident commander and was in a unique position to see the how the surge affected hospital operations.

As we gained more knowledge about the behavior of the coronavirus, we modified our approach to PPE. At the beginning of the outbreak, we were using a very high level of PPE for positive patients and for POI, which also consumed a great deal of time with the extensive donning and doffing process. Getting out of the room took several minutes and eight hand hygiene events. We adjusted our requirements for PPE and created two levels based on whether patients were receiving aerosol-generating procedures. We practiced droplet precautions unless the patient was receiving aerosolizing procedures. We quickly developed a list of what we considered aerosol-generating procedures and the members of the care team who were involved in those procedures. Not surprising to respiratory therapists, we were involved in all of the aerosol-generating procedures. PRMCE is part of the Providence St. Joseph Health Services, which is a large health system; one advantage to working in a large health care system is resource- and knowledge-sharing. The list of procedures that we considered aerosol-generating was quickly shared with other hospitals (Table 1.)

Understanding our patients

Over the next several days, we learned that the majority of patients with COVID-19 were similar to regular flu patients in that they have general illness. A subset of these patients, however, develop acute respiratory failure. These patients decompensate from their initial signs of hypoxemia to acute respiratory failure requiring intubation. This decline often happened in less than 24 hours from the first signs of hypoxemia.

Using conventional therapies to bridge or prevent intubation, such as high-flow nasal cannula therapy or noninvasive ventilation proved not to be useful; these methods only seem to delay definitive treatment. After intubation, these patients presented with severe ARDS. Our primary treatment for these patients has been low tidal volume ventilation. Patients with COVID-19 and refractory hypoxemia were treated with proning. Other sites have reported treating refractory hypoxemia with extracorporeal membrane oxygenation. Although I have heard anecdotal stories of mucus plugging, our experience with COVID-19 is that the patients have had minimal secretions.

Sharing our experience

Darryl Keffer and I shared our anecdotal experience with members of the AARC Adult Acute Care Specialty section during a pre-planned virtual section meeting. A recording of that virtual meeting is available on the AARC's COVID-19 News & Resource website and the Acute Care Section Site on AARConnect.

Our goal was to share our experience and answer questions for the members who have yet to see any patients with COVID-19. If you have a moment, check it out. We discussed many strategies for cleaning equipment, levels of PPE, and approaches to caring for patients who are POI or have tested positive for COVID-19.

Continuing to adapt

As time progressed, we made several adaptions to treating and handling patients. Many of these changes to our standard practices are intended to minimize the need for PPE or to reduce the health care workers' risk of contracting the virus. Like other hospitals across the country, we are faced with limits on our supply of PPE. For instance, we took efforts to prevent patients from being placed in airborne precautions due to the use of a nebulizer. We switched patients' nebulizers to pressurized metered-dose inhalers, and providers quickly adapted. Our pharmacy department ensured that we would have enough inhalers on hand to meet the growing demand. And as resources further shrank, we changed again to limit pressurized metered-dose inhalers just to patients with COVID-19.

Keeping up with the flow of constantly changing information has been yet another challenge. Updates in policy and practice happened overnight and created confusion. For example, we initially thought our patient population numbers would be low enough to sequester a ventilator after use. We realized very quickly that we would not be able to do that. We had to create processes to clean and deploy equipment, and then we had to inform staff on how to do this. As time went on, we modified other practices.

The infection-prevention department used a hospital-based intranet page as a one-stop repository for information. The marketing department came in to help with messaging so that all of the information was as clear as possible. Even with all these tools, keeping staff informed on changes was difficult. Bedside caregivers were working very hard, and their time to hear, read, and generally absorb new information was limited. We made the best use of daily huddles and other communication tools.

Planning and conserving

As the surge progressed, we began to plan for a sustained influx of patients with COVID-19. As you can imagine, many hospitals began to order extra PPE and ventilator circuits, and they made attempts to rent or purchase ventilators. The Providence St. Joseph Health Services system was very proactive in this issue. Even as COVID-19 ravaged China, our leaders took stock of the system's ventilator fleet. A key decision was made to hold onto older, trade-in ventilators to temporarily augment the system's fleet. The system scrambled to acquire any available ventilators. During the first few weeks, I took several shifts as the hospital incident commander and saw firsthand how hard our supply chain worked to keep us equipped. Even with all their hard work, the sudden increase in demand across the United States and the manufacturing disruption created by the coronavirus in China led to PPE conservation measures.

I was pleased to see that the community rallied support to the organization. Our operations center has become overwhelmed with donations from dental clinics and industrial manufacturers with N-95 masks and medical gloves. Smaller local manufacturers are shifting their production to making PPE, and nationally our auto manufacturers are shifting to making ventilators instead of automobiles. The whole nation has mobilized to fight this foe.

Still moving forward

Through all this, the RTs at PRMCE have handled the situation with grace and resilience. They have worked hard to take care of patients with COVID-19 and have been very flexible and understanding in the face of adversity. I am forever grateful to them. To meet the increase need for staff, we brought on travelers and will likely bring on more as demand escalates. Everyone has been personally impacted by the social distancing and the closing of our schools. It is more difficult to obtain basic supplies (eg, toilet paper) and simple services like getting a haircut. Yet, despite these challenges, everyone still comes to work regardless of the personal hardship.
The immediate future is unknown — as of this writing the death toll in New York has surpassed 1,000. The respiratory therapy profession will rise to meet this challenge just like the PRMCE RTs rose to meet the challenge.

My advice to those who have not yet seen the surge is to know what supplies you have, adopt a flexible mindset, and above all take care of yourself. You need to take your time off from work and spend time with your family (observing appropriate social distancing). This is not a sprint, it's a marathon. I am confident that, as a profession, we can confidently say to the country, "Don't worry, we've got this. RT is here."

Table 1. Aerosolizing Procedures per the Providence St. Joseph Health Services Respiratory Resource Council

- Tracheal intubation or extubation
- Any time you open a ventilator circuit
- Bronchoscopy
- Open suction catheter use (eg, tracheostomy, endotracheal tube, nasotracheal tube)
- Placing or exchanging tracheostomy tubes
- Nebulized treatments (pressurized metered dose inhalers should be used unless clinically contraindicated)
- Heated high-flow nasal cannula oxygen therapy
- Continuous aerosol therapy
- CPAP used to treat obstructive sleep apnea (non-acute respiratory failure)
- RT interventions for secretion therapy (eg, chest physical therapy, positive expiratory pressure, intrapulmonary percussive ventilation, Metaneb)

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1. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al. First case of 2019 novel coronavirus in the United States. N Engl J Med 2020;382(10):929-936

about the author…

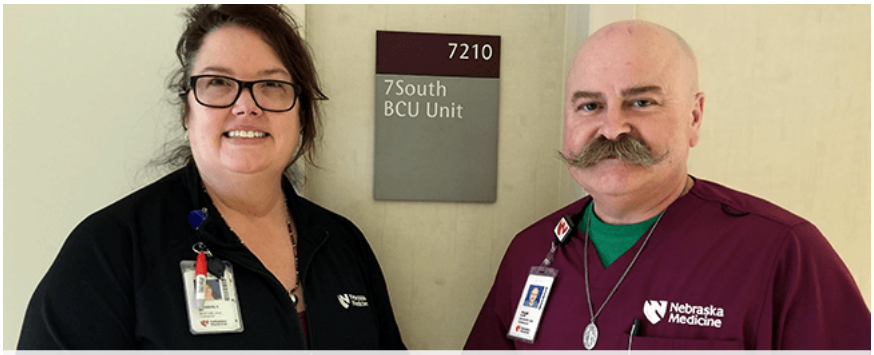
Carl Hinkson, MS, RRT, RRT-ACCS, RRT-NPS, FAARC is the pulmonary service line director at Providence Regional Medical Center in Washington.

COVID-19: On the Front Lines in Omaha

Years of training pay off for RTs on the Nebraska Biocontainment Unit

by Debbie Bunch

Fifteen years ago, a new medical unit went into operation in Omaha, NE. The goal: prepare to handle the most notorious contagions the world could deal out. Located at the University of Nebraska Medical Center, the 10-bed Nebraska Biocontainment Unit was one of just a handful being set up across the country to cope with the likes of smallpox, anthrax, viral hemorrhagic fever, plague, tularemia, and more.



Kimberly Kelly, RRT, left, and Frank Freihaut, BS, RRT, are battling COVID-19 at the University of Nebraska Medical Center.

Frank Freihaut, BS, RRT, has been with the unit since its inception and has worked tirelessly over the years to ensure that the respiratory therapists on staff would be ready for the worst when it arrived. He helped care for Ebola patients admitted to the unit in 2014, and he has been front and center during the COVID-19 crisis. He and his four RT colleagues in the unit saw several COVID-19 patients

at the start of the pandemic and are now working to ensure that everyone on the UNMC staff is prepared for whatever may come their way in the days ahead.

Evolving situation

According to Freihaut, their introduction to COVID-19 came in March, after the first group of people in their area tested positive for the virus.

“Nebraska Medicine and the University of Nebraska Medical Center operate the National Quarantine Unit in a separate building on campus from the hospital,” he said. "Thus, when several persons were brought to the quarantine unit who had tested positive, we knew there was high probability of activating the biocontainment unit.”

That possibility was realized when several of those people ended up requiring hospitalization while waiting to have two negative COVID-19 tests so they could go home. Five patients were admitted to the unit, and all five were discharged when their need for inpatient care was resolved. As of this writing in late March, Freihaut and his colleagues were still caring for one COVID-19 patient who came to them from the Omaha community in critical condition. Given the rapidly changing situation with COVID-19, the hospital has now decided to decommission the biocontainment unit and hold it in reserve, but the team’s work is far from done.

“Our facility has moved forward from the containment phase to the ongoing management and mitigation of this infection,” Freihaut said.

A larger floor of the hospital has been dedicated to patients with COVID-19, along with those who are waiting for negative test results so that they can be discharged.

“Our current plan will be to use the biocontainment unit for an ICU overflow as we get more critical care patients,” he said.

Updating protocols

The sheer number of patients who will end up needing critical care during this crisis has led UNMC to begin streamlining some of its protocols and procedures to allow RTs to make care decisions that

would otherwise require multiple calls to the intensivists on staff. Freihaut believes the camaraderie that exists among clinicians in the biocontainment unit is helping to make that possible.

“Our respiratory therapists have gained a great multidisciplinary respect from the physicians and nurses who work in the biocontainment unit and now our COVID-19 unit,” he said. “The physicians and nurses are pulled from almost every care unit at Nebraska Medicine, and since our therapists work throughout the entire hospital, a great sense of pride is felt when they run into each other in their home units.”

It’s very much a “band of brothers,” he continued, where each team member looks at their fellow team members as people who have gone through battle with them.
In the current battle, the thinking is that RTs can take on more responsibility for managing PEEP in these patients.

“In reviewing the literature, our medical team has seen that these patients can be very PEEP-dependent and may be responsive to therapeutics such as prone position to aid in ventilation perfusion matching,” explains Freihaut. “Thus, we have quickly updated an ARDS ventilator titration protocol we had to not only give the RT guided ability to reduce PEEP as the patient’s oxygenation improves, but also to increase PEEP if the oxygenation requires a sustained increase in F_iO_2.”

He says they are using the tidal volume range of 4–6 mL/kg ideal body weight and maintaining plateau pressures of 30 cm H_2O or less. They are also employing a simplified PEEP table based on the original ARDSNet table from the National Institutes of Health.

As for the proning element of this new protocol, Freihaut notes they have always proned patients with refractory hypoxemia, but they are now formalizing their protocol for ease of use.

"Our hope is, if we get inundated with critical patients, we can help the physicians manage the ventilators with a quicker response for better patient outcomes,” he said.

Freihaut says this mindset is embedded in a team that has learned from experience that there isn’t much they can’t take on. In the early days they thought they wouldn’t even try certain procedures in certain patients because they were too risky, but today they know you can’t really say no when a life is at stake.

“After intubating and ventilating and doing dialysis on an Ebola patient, we realized you can’t plan to not care for a real patient,” he said. “We all went into health care to help people get through troubled times, not to give up on them.”

Over the past several years, he says the plan has become, “Okay, how can we do the next level of care and keep staff safe? What level of personal protective equipment is needed? Can a device be modified or utilized in a way that won’t take the machine out of commission if we use it in the ‘hot zone?’” In all cases, he emphasizes, their thinking is that it is better to prepare for the worst-case scenario and hope it won’t happen than it is to hope it won’t happen and then have to play catch up when it does.

The right way

One component of the training they all received as a part of the unit — the proper donning and doffing of personal protective equipment (PPE) — is especially critical for anyone faced with caring for patients suffering from COVID-19. The nurses and RTs on the team are now taking the lead as the core staff to help others with just-in-time training.

“This is logical, since we drill on infection prevention within the unit several times a year and we have experience treating actual patients with Ebola and COVID-19,” he said. “During a situation like this pandemic, our hospital’s infection-prevention department gets stretched thin, and it is a good feeling for our biocontainment team to be a hands-on resource for helping to train other caregivers throughout the hospital.”

One fact that they stress repeatedly with the caregivers they train is the importance of following strict rules when it comes to taking off their PPE.

“We know from the SARS and the 2014 Ebola outbreaks in western Africa that it is often the doffing or removing of your PPE that causes skilled health care personnel to acquire the very pathogen they had otherwise protected themselves against,” he said. “We have videos and infographics for staff to learn from, and we walk all new caregivers through the process the first time they come to deliver care in the unit.”

Slowing down and going through all the necessary steps may not come naturally for busy clinicians anxious to move on to their next patient, but getting past the “great, I’m done in that room, let me rip off this PPE” mindset is the only way for clinicians to keep themselves safe.

“We all want to go home to our families and know we are not taking anything extra to the house,” Freihaut said. “We need each of us to be able to work tomorrow. We cannot afford staff to be out sick as patient admissions surge.”

All hands on deck

Gaining control of COVID-19 will be a monumental task, but Freihaut knows his fellow RTs have what it takes to help the health care system prevail.

“We have a great ability to evaluate device management. We deal with several patients on life support daily and look at what staffing we need to care best for those patients,” he said. "Respiratory therapists are a great resource when planning for increased emergency capacity in the ICU, and how we can use ventilators to the best advantage. We extend the range of the physicians and nurses in the critical care environment, which is crucial when planning for a surge of patients such as in an epidemic or pandemic.”

Freihaut emphasizes that it is a team effort there at UNMC. He applauds not only his fellow RTs, but also the doctors, nurses, and even administrative staff who have all been working tirelessly since mid-January to meet this health care challenge head on.

“I pray for the best and continue to work with a great team that is preparing for the worst,” he said

The World-Wide Response to COVID-19

International Medicine in Real Time

by PJ Papadakos, MD, FCCM, FCCP, FAARC

In the international response to this terrible virus, COVID-19, one thing that has been made clear to me and others is the international cooperation of medical professionals. As an individual with a broad network of colleagues in critical care, it was outstanding how rapidly we all joined via e-mail, WhatsApp forums, ZOOM conferences, and others to share protocols, guidelines, research, and patient care experiences. We circle the globe, hailing from every state in the United States, and from China, Japan, Italy, Spain, Germany, Holland, Canada, and more. I am thus able to share information almost hourly with my team and with the leadership of the AARC to get the latest medical information out to aid the care of our patients. I wish to take this opportunity to share some of this information from countries in Asia and from Spain and Italy.

Staffing and Logistics

The key message is that this challenge requires a deep reorganization of our work and staffing models. We do not wish to let administrators think they can run business as usual. By now, we're all dealing with COVID-19. This is not just an ICU problem — it is a hospital-wide problem.

All over the world, elective surgery has been stopped as soon as you see the first inflow of COVID-19 patients in your community. Hospitals in Toronto have run simulations and came up with a surge plan. They will shut down the operating rooms and move or discharge as many patients as possible. Some areas have developed plans to use Ambulatory Surgery Centers as patient-overflow areas to decompress their wards if the hospitals are overwhelmed with patients. Anesthesia machines and anesthesia providers may reinforce ICUs to care for patients in respiratory failure. Local and national governments may deploy military assets to build and staff temporary hospitals.

As the number of individuals in the community infected with COVID-19rises, staff members may be affected. This has been reported throughout the world. Departments need to have plans in place for blocks of reserve staff. In other words, keep two thirds of your critical staff at home and away from hospital patients so they can replace staff as they become ill or fatigued. Cut down on rounding teams, and use non-ICU providers for various tasks, such as surgeons to gain vascular access, anesthesiology

staff to do all hospital intubations, and post-operative nurses to reinforce ICU nurses. Each hospital can develop its own plan based on its level of staffing.

Patient Profiles

In normal circumstances, younger patients should do well without advanced measures. Patients typically come in sick after 7–9 days of milder symptoms. There is a surge of younger patients right now who require elevated levels of care. Alarmingly, the average age of ICU patients is decreasing in Italy, Spain, and the United States. These younger patients will tie up resources for longer periods of time.
Several countries are already withholding and withdrawing care from older patients with comorbidities, which may affect mortality data. They are also not escalating care (eg, CRRT dialysis). The standard of care is decreasing, and patients are being increasingly triaged to comfort care in many nations.
It is vital to develop ethical consult services to aid in patient care if we reach this point in the United States.

Clinical Advice

This is a summary of "Clinical Pearls" from leaders in Spain, Italy, and Korea. The good news is that patients seem to behave predictably. They have severe hypoxemia but are easy to ventilate with standard tools that we as RTs use each day. There has been a limited need for extracorporeal membrane oxygenation (ECMO). There also seems to be a difference with influenza-related ARDS.

Noninvasive support

Do not overdo noninvasive ventilation (NIV) as patients decay and crash quickly. If S_pO_2 is less than 95% or P_aO_2/F_iO_2 is less than 200 irrespective of breathing frequency at F_iO_2 60%, intubate immediately; if noninvasive CPAP is required, use helmet CPAP. This is popular in Europe and extremely handy in this situation because it can be managed by non-ICU staff and helps avoid dissemination via droplets. This is not FDA-approved as of yet in the United States, but this may change rapidly. Alternatively, it is unclear whether NIV vs high-flow NCO_2 is better in terms of reducing spread via droplets. The Italian and Spanish physicians prefer not to use high-flow therapy.

Invasive ventilation

Utilize standard, low-stretch, lung-protective ventilation. Use moderate to high PEEP of 13–18 cm H_2O, and exercise minimal use of recruitment maneuvers. Compliance is usually good, so expect plateau pressures be at or below 25–27 cm H_2O (lungs are easy to ventilate) with driving pressures below 13 cm H_2O. Increase F_iO_2 if needed; my contacts say they usually start with very low P_aO_2/F_iO_2 when intubated, and this can improve slightly — don't worry, this is normal, and most patients do well with conventional settings. Patients respond well to prone position, which can be used aggressively. Staff should be well organized and mindful of the time needed to dress before entering patient rooms in emergencies. Develop and train staff, including nurses, in a proning protocol.

Use of ECMO seems to be rare. Most patients do well on conventional ventilator management. ECMO is not your problem — having enough ventilators and staff is.

Patients also respond to inhaled vasodilators, but epoprostenol is problematic if you use antimicrobial heat and moisture exchangers (recommended instead of humidifiers).

Hemodynamics

Most patients need low to medium use of norepinephrine (ie, the drug of choice in Europe) because patients are sedated for 4–7 days as this maintains pressure and reduces the need for staff to enter the room. Minimize fluids, and use pressor agents early. Myocardial dysfunction seems to be a big deal in China. Myocarditis seems to be common and is suggested by frequent effusions. Use of cardiac echocardiography is key.

Delayed weaning

Patients experience recurrent hypoxemia after weaning airway pressure too quickly, and then they require time to recover. Professor Pelosi in Italy keeps patients deeply sedated for 4–7 days and then attempts to wean. Be very careful due to recurrent hypoxemia. All of my contacts in a number of countries say to expect ventilation to last 10–14 days.

Use of BAL after intubation is controversial

In Italy they perform postextubation bronchoalveolar lavage (BAL) because they have observed many cases where a swab test was negative whereas BAL was positive. This is still subject of discussion.

Antiviral cocktails in use around the world

(Darunavir o lopinavir) + ritonavir + oseltamivir + idrossiclorochina 200x2 + ceftarolina)
These therapies are being directed by infectious disease specialists. The FDA has newly approved the use of chloroquine. Do not use corticosteroids. In resistant shock with low ACTH level use 200 mg per day either as bolus dosages or as a infusion. This is controversial but is being used as rescue therapy by many.

This is also controversial but is being used in rescue therapy by many health care providers.

I wish to thank all of the physicians, nurses, therapists, and hospital workers around the world who continue to fight the virus and work to develop a vaccine and therapy to address this problem, which will be the crisis of this generation.

about the author…

PJ Papadakos, MD, FCCM, FCCP, FAARC, is director of critical care, professor of anesthesiology, surgery, neurology, and neurosurgery, and chair of the Board of Medical Advisors for AARC.

COVID-19: On the Front Lines in Chicago

RTs at Rush University Medical Center are ready to roll

by Debbie Bunch

Rush University Medical Center is a nationally ranked academic medical center in Chicago, IL, with more than 650 beds and about 7,100 employees. As such, it is playing a key role in caring for those who are suffering from COVID-19, and the respiratory care department is working overtime to ensure these patients receive the care they need based on the latest scientific evidence available on treating the disease.

Rounding up the vents

Chief on the list for Department Director Steve Mosakowski, MBA, RRT, RRT-ACCS, RRT-NPS, CPFT, FAARC, has been to address the availability of ventilators currently in the hospital and plan for future needs.

“We have over 110 ventilators available at our academic medical center,” he said.

While they work closely with their clinical engineering teams to ensure those vents are ready to go at all times, Mosakowski knows he’s going to have to step up the game to handle COVID-19. He is working with his supply chains on a daily basis to make sure they have all the supplies they need to support the variety of devices they have at their disposal, and they are reaching out to their rental companies to see what they have left in their supply that could be utilized at Rush.

Every morning, Mosakowski and his team also reach out to the other facilities in the Rush system to come up with an accurate report on the number and types of ventilators they all have available. Rush University’s labs have been contacted to see what types and quantities of ventilators they may be able to add to the mix, too.

“Our other local college also had a few vents in their lab that they are able to loan us,” Mosakowski said.

In addition, the department is working with the anesthesia department to find out if anesthesia machines can be pulled out of their post-anesthesia care unit now that most surgeries have been postponed,

essentially turning the post-anesthesia care unit into another much-needed ICU. The hospital knows, however, that it might have to purchase additional ventilators, and the purchasing department is in contact with ventilator manufacturers to discuss future orders.

The other half of the equation for Mosakowski has been making sure he has enough adequately trained staff to operate the sheer number of ventilators that will be needed to get his hospital through the crisis.

"Luckily I get to work with some of the best educators in the world," he said. That's making it possible for an "all hands on deck" mentality. "We are pulling all RTs from our out-patient PFT (pulmonary function test) labs, pediatric PFT lab, sleep labs, and from our MSRT program to help clinically." They are also working with agency partners to bring on any RTs who pass their interviews, and they are exploring having all staff step up to full-time status during the pandemic. Undergrad students may be called into action as well.

"We're looking at our second-year students who are close to graduation to see how they can help," Mosakowski said. "We'll also work with our anesthesiologists to help us with their anesthesia vents as necessary." He believes all these efforts will pay off in the end for Rush. "Things are going well as we prepare for whatever comes next," the manager said.

Following the evidence

As an associate professor of respiratory care and clinical education coordinator at Rush, Jie Li, PhD, RRT, RRT-ACCS, RRT-NPS, is playing an integral role in ensuring RTs stay safe while they use those ventilators and perform other aspects of care available to patients with COVID-19.

"We did a comprehensive literature search on the topics of preventing nosocomial transmission during respiratory care for COVID-19 patients, then we made evidence-based recommendations for our staff," she said. Training materials were created to train staff on the evidence-based guidance.

The literature search resulted in some immediate changes in clinical practice. For example, therapists are now wearing a surgical mask for COVID-19 patients receiving a high-flow nasal cannula, they are replacing small-volume nebulizers with a metered-dose inhaler plus spacer or a mesh nebulizer with a handheld set up with a mouthpiece, and they are placing a filter between a resuscitator and mask.

"We also worked with our emergency department pharmacy and nurses to create a bronchodilator algorithm to reduce or avoid the exposure of virus transmission," Dr. Li said.

J. Brady Scott, MSc, RRT, RRT-ACCS, AE-C, FAARC, FCCP, who serves as an associate professor and director of clinical education for the Rush University respiratory care program, says the department is working to ensure RTs are well versed on the correct way to don and doff their personal protective equipment as well.

"It is imperative that our staff stays safe during this pandemic," he said.

Other changes are underway that will hopefully give more patients a better chance of survival. Scott explains, "Alongside our nursing and physician colleagues, we are focused on getting our staff ready to manually place patients in the prone position for severe acute respiratory distress syndrome." He notes RTs have traditionally used a mechanical bed to perform that procedure, but those beds are now in short supply. They are following the method they originally outlined in the 2018 edition of the Respiratory Care Educational Annual. (Read that paper **here.)**

All these moves are guiding clinicians — in some cases not just RTs but nurses, too — on the best way to care for patients who come to their hospital with COVID-19. The department is working to share what it has learned as well. Dr. Li says a manuscript based on her evidence-based search has been drafted and will be submitted to a journal for publication. The International Society for Aerosol Medicine also invited her to present a special webinar on the recommendations that ensued from that work, and more than 200 people were in attendance. As of this writing in late March, Dr. Li was planning to present the session again on March 30.

Protecting the next generation

Clearly, hospitals are at the center of the fight against COVID-19. But educational programs are having to adapt to the challenge, too, because without a steady stream of new RTs into the system it is bound to fail. The respiratory care program at Rush University is getting up to speed as quickly as possible.

“We were fortunate that we were using hybrid courses, so a lot of content was available for students online, such as video demonstrations of various ventilators and recorded lectures from our faculty and medical director,” said Program Chair David Vines, PhD, RRT, FAARC, FCCP. “The live classroom teaching was converted to live ZOOM sessions.” That has been going well, he says.

"Handling the examination process has been a little trickier. Our online proctoring partner discontinued services due to the virus on March 23. Luckily, there are other options out there," Dr. Vines said.

The biggest challenge the program faces, though, is planning for the clinical education of its students.

“We use a lot of simulation training in our program to prepare students for clinical practice, but students need hands-on clinical practice with patients to develop patient care and time management skills that are difficult to simulate,” he said.

Right now, job one is to keep students safe, so Dr. Vines and his colleagues are asking students to take the precautions everyone is being asked to take — practice social distancing, avoid touching their faces, cough into their elbows, and engage in appropriate hand washing. While students nearing graduation may, as Steve Mosakoswki indicated, eventually have a role to play in patient care, right now clinical rotations have ended and students are being told to stay safe at home.

“We plan to increase clinical time in the summer to make up for the time that students are currently missing in the last few weeks of the spring semester,” he says. “When they return to the clinical setting, as with all health care workers, we are hopeful that COVID-19 teaches everyone the importance of good hand washing and standard precautions.” He believes these are the right steps to take in this crisis and reflect the dedication of RTs to rise to the occasion. “Every day brings a new challenge, but just like respiratory therapists before us, we will adapt and overcome these challenges.”

Mitigating the crisis

Hospitals across the country are currently engaged in planning for and treating patients with COVID-19, and these experiences at Rush University Medical Center and the Rush respiratory care program provide just one snapshot of what has been going on. As these RTs illustrate, failure is not an option. Therapists can and will bring themselves up to speed on the latest evidence surrounding COVID-19 and think outside the box to come up with strategies and solutions that will mitigate the crisis.

COVID-19: On the Homefront

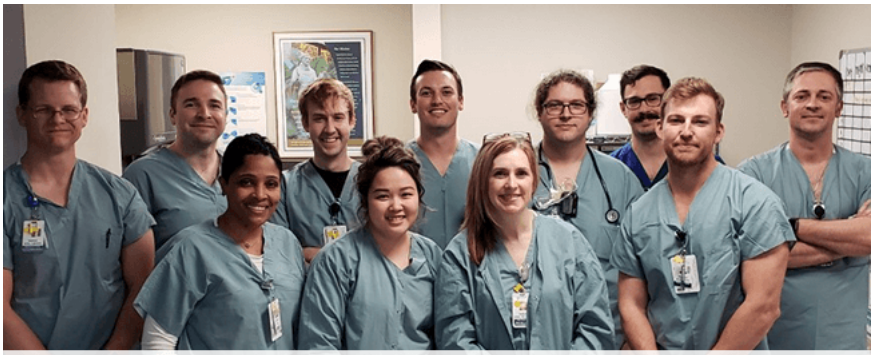
Wife of RT Shares How COVID-19 Patient Care Moves Beyond the Hospital Room

by Breana Batton

Just what on earth is a respiratory therapist (RT)?

Simply stated, they are medical professionals who specialize in providing health care for your lungs. Do not make the mistake of calling them techs (you can thank me later). They are therapists with bachelor's, master's, and/or associate degrees and can specialize in a load of different things while holding advanced certifications in life-saving techniques.

My husband is a registered respiratory therapist here in Baton Rouge, LA. That fact never brought fear to my heart in the past. He works night shifts, primarily in the emergency department at a major hospital. The worst thing I could imagine happening to him was maybe a patient attempted to attack him. I couldn't think of anything truly life-altering happening — I mean, I am not the terrified wife of a police officer or firefighter or a military wife … I'm the wife of a man who loves learning medicine and truly cares about correct and thorough patient care.



Ryan Batton, RRT, RRT-ACCS, RRT-NPS, (back row, third from right) and the Our Lady of the Lake Regional Medical Center COVID-19 Night Shift Front-Line Team in Baton Rouge, LA

As the novel COVID-19 virus started coming into the picture, my husband and his colleagues had a feeling of how monumental this would be. I thought it was the media pumping this up; — I didn't actually believe something would cross the ocean into our safe United States — as the youngins say, "Nothing ever happens to me here in #Merica."

Then things changed so quickly.

We have technically known about this virus since November or December 2019 when it was an epidemic, which is defined as a disease that affects a bunch of people suddenly. And now it's become a pandemic, which means it is affecting the whole world. Should we have been more prepared? What happens if we don't act quickly now?

I feel like the weekend of March 14–15, 2020, marked the first three days of this virus making its mark in Baton Rouge. It has been in New Orleans a bit longer, and longer still throughout the country and the world. After working a 12-hour night shift, my husband, who usually is excited to talk about how he nailed an arterial line, intubated, got his hands inside someone's chest to massage their heart, or dealt with lung mucus, instead came home exhausted.

Instead of coming home to tell me about his night — as if I had a PhD in more than just being his wife — he brought the sobering message that he will be volunteering to work in the new COVID unit and that we needed to talk about how our son should leave our home. As a respiratory therapist, my husband is at high risk of being infected and, in turn, so are we, and we cannot put our child in danger. While it is true that, from what we understand so far, this doesn't affect kids in the same way it affects immunocompromised or older adults, the little nugget can easily become a carrier, and that's too much of a risk.

This morning I wept as I packed his clothes, toys, board games, books, costumes, snacks. I wept at the thought of not knowing when it will be safe for him to return home. I wept knowing my husband is so dedicated and determined to care for his patients that he volunteered to work the next 15 nights consecutively and to help on nights for the foreseeable future. It was no surprise to me that he wanted to do his part to help with this pandemic. I wept at the thought of the people in our community who do not understand the sacrifices that our hospitals and their staffs are making for their patients — FOR US! Countless sacrifices from doctors, RTs, nurses, the environment staff, security guards, administration, the CDC, the World Health Organization, local government, and other people and groups who are behind the scenes doing everything they can do help — it is truly taking a village!

Let's ask ourselves, as informed adults, what are we doing to help?

Are we panic-buying up supplies, like masks that our hospitals need to be able to care for our family members in a safe way? Are we practicing prudent and authentic social distancing to stop the spread of this catastrophic virus? Are we taking this seriously at all?

We had to make the informed and excruciating decision to send our child away because my husband is at high risk of contracting this virus due to the nature of his work. I do not know when things will be normal again or when our family can be home together again. It rips me to shreds to think about what my family and other medical families are sacrificing to protect everyone from this rapidly spreading pandemic. I ache to my core when I think about families throughout the world who have lost their loved ones, and it could have been minimized by something as simple as hand washing and social distancing. It is not just us; all medical staff must take precautions for their children and family members as we did. When you go to bed tonight, think of our local hospitals, which are filled to the brim and working to exhaustion to save our neighbors, families, and friends … all while completing the usual day-to-day hospital tasks.

What if the decisions that people are making to go on a cheap vacation spreads this virus to thousands? I believe we truly do not have the resources or a proper understanding of what hospitals are going through right now. This is a new virus and uncharted territory for everyone involved.

To give you an idea of the lengths that medical staff must go through to stay safe, my husband shared with me that, before entering each patient's room, he must put on protective clothing, a special mask, and goggles. This is a time-consuming process. Waiting for the positive or negative test result is a time-consuming process that can take days. Having to change out of the protective gear, clean the goggles in a special solution, discard the mask, get new gear and a new mask to go into the next patient's room is time consuming, just to avoid contaminating his own clothes and the equipment around him. Repeat. Repeat. Repeat.

He will do this night after night.

He will make the sacrifices needed to care for his patients and slow this pandemic.
This is real.

This is happening in our backyard and around the world.

Ryan & Breana Batton on their wedding day.

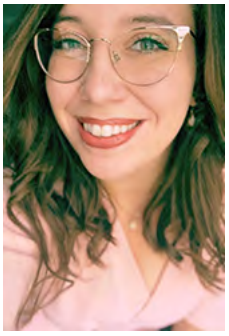
I am the wife of a man, just one of many, trying to spread the message of proper health and safety to protect the public in our town, city, country, and world.

Let's do our part.

Please, for the love of God and all that is holy, take this virus seriously before we must make the difficult choices being made in Italy.

"Wash your hands." – Ryan Batton RRT-ACCS, NPS

about the author…



Breana Batton lives in Baton Rouge, LA with her husband Ryan, their five-year-old son Thomas and their four dogs. She works for both the Professional Emergency Medicine Management at Thibodaux Regional Medical Center and the Professional Emergency Physician Associates at Our Lady of the Lake Regional Medical Center. When she's not working, she's writing for the Red Stick Moms Blog or singing for Weddings across Louisiana.

This story was originally posted in the Red Stick Mom blog.

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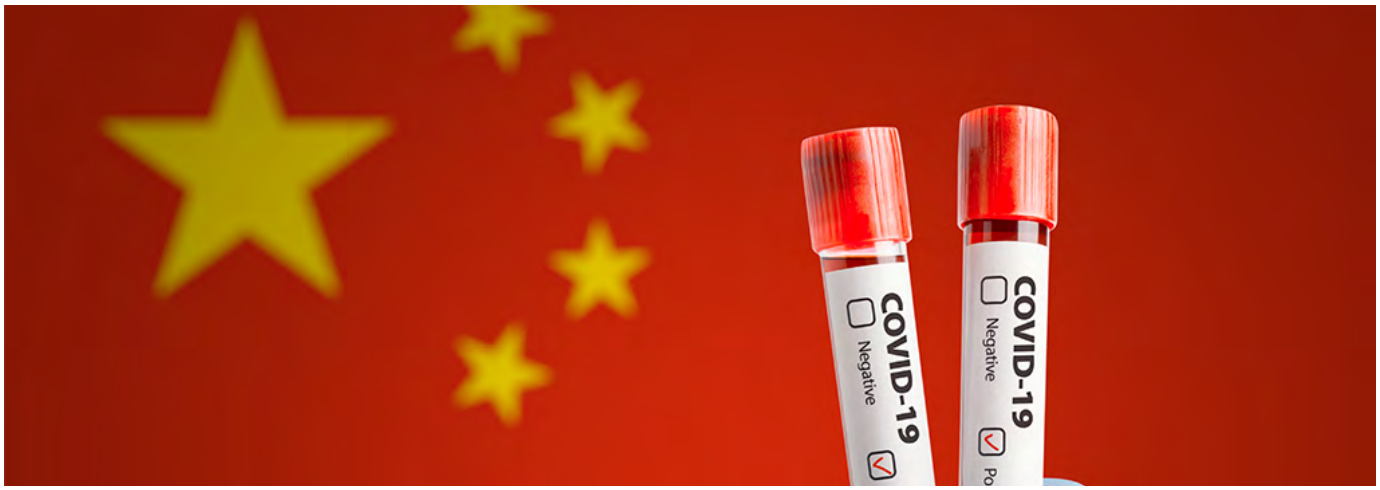
Share the Experiences of the COVID-19 Mission

by Liang Xu, MS, MD, Chin-Jung Liu, MSc, RCP, and Chia-Chen Chu, PhD, FAARC



Doctors from China recount their experience with the COVID-19 epidemic in their communities. The experiences and suggestions shared are not to be taken as clinical advice.

On Dec. 30, 2019, the government of the People's Republic of China announced a new job title of respiratory therapist.

On Jan. 23, 2020, Wuhan City was in lockdown due to COVID-19, and Dr. Liang Xu had just worked in the key designated hospital to treat the critical condition. As the director of the critical care department, Dr. Xu had the experiences of first-line face-to-face contact with COVID-19 pneumonia.

On Mar. 17, Dr. Xu announced that Wuchang Hospital had discharged the patients, disinfected the environment, and was preparing to return to normal condition to treat ordinary patients.

On Mar. 18, Dr. Xu shared his experience of caring for patients with COVID-19 through a web conference with respiratory therapists from the Department of Respiratory Therapy of China Medical University Hospital.

Dr. Xu shares his COVID-19 patient care experience with respiratory therapists in the respiratory therapy department at China Medical University Hospital through a web conference.

Classifications of COVID-19

Dr. Xu explained that China's diagnosis and treatment guideline classifies COVID-positive patients into three categories: mild, severe, and critical. Patients with mild cases present with fever, respiratory tract and other symptoms, and imaging showing pneumonia. Patients with severe cases present with any of the following: respiratory distress (breathing frequency ≥ 30 breaths/min), breathing air in a quiet state ($S_pO_2 \leq 93\%$), or $P_aO_2/FiO_2 \leq 300$ mm Hg. Patients with critical cases present with any of the following: respiratory failure requiring mechanical ventilation, shock, or other organ failure that requires ICU monitoring and treatment.

For patients with this illness, the virus mainly causes damage to the interstitial lungs and leads to disordered gas diffusion, which eventually leads to hypoxia in patients with dry cough. Therefore, when patients are treated with medications after entering the ARDS phase, traditional methods of ARDS treatment may not be able to effectively improve the patient's oxygenation.

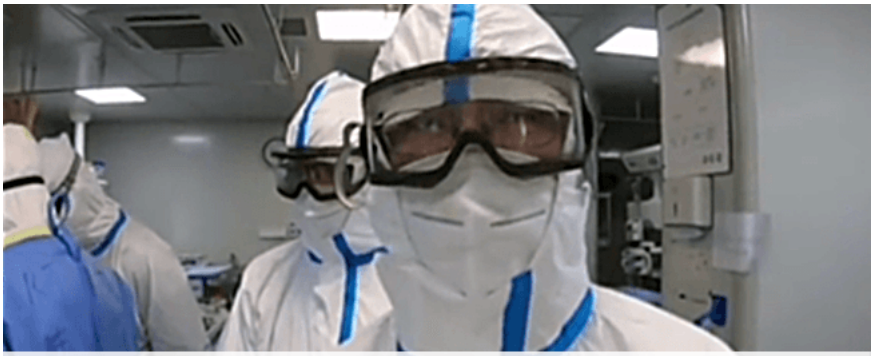
In China, our experience is to treat patients with high-flow oxygen early after they are affected by the disease. As long as the patient can tolerate it, the flow should be as high as possible. Good respiratory tract humidification, coupled with precise adjustment of oxygen concentration and PEEP, can effectively reduce the patient's work of breathing.

The medical team continued assessing patient respiratory distress by observing the patient's breathing frequency, tidal volume, inspired oxygen concentration, the patient's subjective feelings, and periodic arterial blood gas analysis (especially P_aO_2/F_iO_2 and lactic acid in the blood). If the patient's condition did not improve or worsened within 1–2 hours, the next step was to apply noninvasive ventilation (NIV). When using NIV, medical professionals paid close attention to tidal volume, breathing frequency, patient inspired oxygen concentration, P_aO_2/F_iO_2, and lactic acid in the blood. The goal is to get the tidal volume to be less than 6–8 mL/ideal body weight (kg), breathing frequency to be less than 30 breaths/min, and $P_aO_2/F_iO_2 > 150$. This will mean that the patient's respiratory drive pressure and transpulmonary pressure are not high, and the incidence of lung shear injury is not high.

Appropriate sedatives, used only when necessary, proved helpful to reduce patient anxiety and oxygen consumption. If the above indicators continued to deteriorate, the team’s next step was to apply NIV.

It is difficult to codify the timing of these three oxygen therapies. So far, there is still a lot of controversy in application. It is our opinion that we should evaluate the oxygen supply and consumption of patients to determine the method and timing of oxygen therapy. Furthermore, physicians must make a point to assess the physiological changes of each patient at different stages of the disease and use different oxygen treatments as appropriate. Sedation and analgesia can reduce patient anxiety and oxygen consumption.

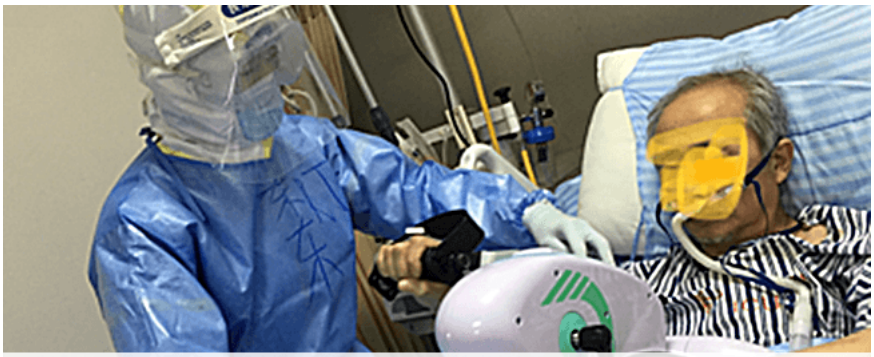
In the NIV phase, many patients have no influence on the recruitment maneuver. For patients with severe hypoxemia, our team applied prone ventilation for at least 16 hours. At this time, it is suggested that patients with hypoxemia who are undergoing mechanical ventilation can try prone position ventilation as early as possible and even prone position on the basis of analgesia for conscious patients during high-flow oxygen therapy and NIV stages. The team’s goal was to keep the driving pressure within 15 cm H_2O. In fact, if patients must receive NIV, the mortality rate will be high. To improve the protection of medical personnel, virus filters must be specially used when during NIV. When intubating, muscle relaxants must also be used to avoid the large droplets and aerosols that are caused by coughing.



Dr. Xu utilizes full protective clothing to care for patients with COVID-19.

About Dr. Xu

Dr. Xu first received three months of respiratory therapy training courses at the Hunan Provincial People's Hospital in 2012, and received one month of respiratory therapy training at the China Medical University Hospital in 2014. After he returned to work, he actively organized various mechanical ventilation training courses, and he also gave lectures to other hospital to promote respiratory therapy technology. He received an AARC international fellowship in 2018, visited Atlanta, GA, and Greenville, NC, and he won an ICRC Governor-at-large position in 2019. With this background, he has strong knowledge of respiratory therapy and is proficient with respiratory therapy technology, which have helped in the treatment of patients with COVID-19 pneumonia. In this epidemic period, many respiratory therapists of China have also volunteered in Hubei Province to help the medical work heavily. Dr. Liang Xu also thanked the Taiwan Society for Respiratory Therapy for helping the epidemic prevention supplies in the most difficult stages.



A respiratory therapist at Wuchang Hospital trains a patient on lung rehabilitation equipment.

International Fellow AARC_XinJiang China, 2018

about the author…

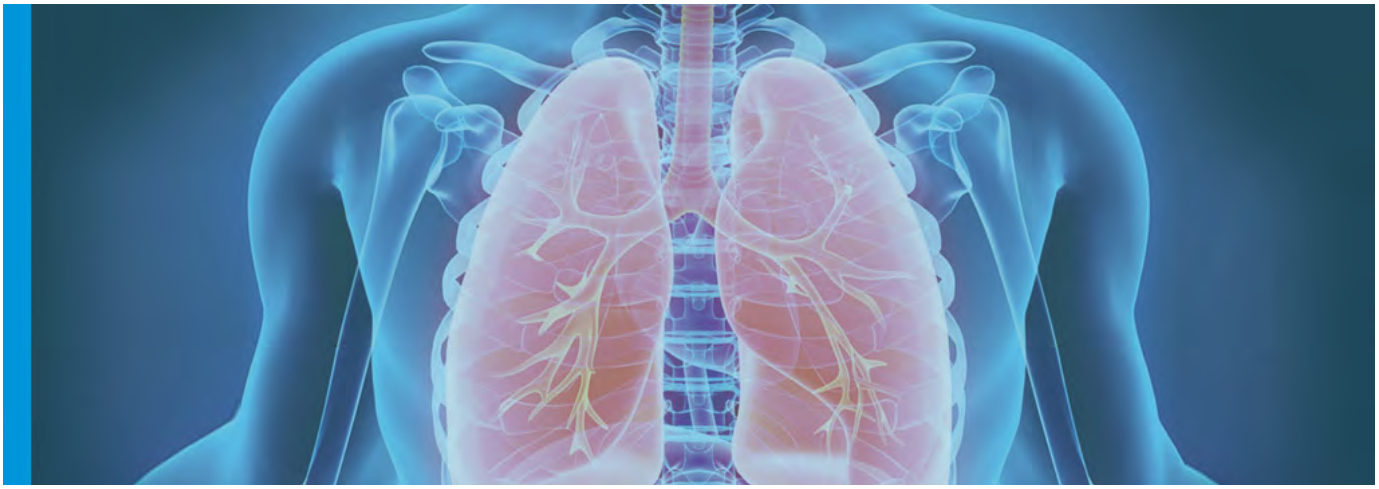
Liang Xu, MS, MD, is part of the Department of Critical Care Medicine at Wuchang Hospital in Wuhan City, Hubei Province, China; he is a past AARC International Fellowship recipient and an ICRC Governor.

Chin-Jung Liu, MSc, RCP, is part of the Department of Public Health at China Medical University in Taichung, Taiwan, ROC, and is an ICRC Governor.

Chia-Chen Chu, PhD, FAARC, is part of the Department of Respiratory Therapy at China Medical University Hospital in Taichung, Taiwan, ROC; he is a past AARC International Fellowship recipient and an ICRC Governor..

Extracorporeal Membrane Oxygenation (ECMO) : Be Sure as to "Why"

by Maria Madden MS, RRT-ACCS, and Marlin Martin RRT-ACCS



Due to improvements in technology, the development of ECMO specialists, and increased experience of dedicated ECMO centers, the use of ECMO increased by 433% in adult patients from 2006 to 2011 in the United States.[1] ECMO is a complex and potentially life-saving intervention supporting patients in both cardiac and respiratory failure. The initiation of ECMO cannot be taken lightly or considered best practice for all patient populations. The selection process is crucial, often a matter of life and death. Important questions must be asked in the decision-making process and the implementation of placing a patient on ECMO. Why does this patient require ECMO? Are all the necessary resources in place to provide ECMO? How will the patient successfully navigate the process of ECMO? What is the exit strategy, that is, how will ECMO therapy be discontinued? Finding the answers to these questions can prove far more difficult than the reasons for initiation.

What is ECMO?

Let's back up for a moment and explain ECMO, a simplified version of cardiopulmonary bypass. It is provided in an intensive care setting for days, weeks, and at times for months under unforeseen circumstances. There are essentially two versions of ECMO: venoarterial (VA) and venovenous (VV.) VA-ECMO removes blood from the systemic venous circulation and returns it back into the systemic arterial circulation.[2] This type of ECMO can provide both cardiac and respiratory support. VV-ECMO removes blood from the systemic venous circulation and returns back into the systemic venous circulation.[2] While utilizing the patient's native circulatory system the goal with VV-ECMO is to provide oxygenation and remove carbon dioxide. Both forms of ECMO are very expensive and labor-intensive, and are not designed to be the patient's destination therapy.[3,4]

Why ECMO?

VV-ECMO

Indications for VV-ECMO are numerous. Severe respiratory failure unresponsive to advanced mechanical ventilation strategies, refractory hypoxemia, many etiologies of ARDS, bridge to lung transplant, and post-lung-transplant rejection are valid indications for initiation of VV-ECMO.[5,6] Implementation of VV-ECMO in patients with ARDS is now on the rise. Since 2009, the usage of VV-ECMO has also increased due

to the emergence of influenza-A (H1N1).[7] As of April 7 2020, the FDA has also sanctioned the use of ECMO in COVID-19 patients.[8] Therefore, the same employments may soon emerge in regard to initiation of VV-ECMO in battling SARS COV-2, since it is reported that 15% to 30% of patients with COVID-19 will develop ARDS.[9,10] Implementing ECMO in COVID-19 patients is associated with a great deal of risk such as increasing clinician exposure during transport and in daily care activities as well. The availability of ECMO centers are also far less than major healthcare facilities with expertise in mechanical ventilation strategies. The selection process, transfer, admission, intensive care unit resources and maintenance of continued care are all factors that must be considered for which patients are to receive this therapy. More collected data and subsequent reports from ECMO centers treating severe COVID-19 patients are necessary.[11] However, ECMO is not likely to increase survival in this patient population if they exhibit the comorbidities of septic shock or refractory multiple-organ failure.[10] Consider this poignant statement, "ECMO is not a therapy to be rushed to the frontline when all resources are stretched in a pandemic."[10] This is thought-provoking to say the least!

VA-ECMO

Indications for VA-ECMO are also numerous and are continuously increasing as creative health care providers continue to push its limits. VA-ECMO is indicated for patients in cardiogenic shock with low cardiac output and hypotension despite adequate intravascular volume and high doses of positive inotropic agents.[5] In the initiation of VA-ECMO, the aim is to restore organ blood flow, provide adequate tissue oxygenation, and remove carbon dioxide. The primary goal is to use VA-ECMO to bridge these patients to recovery or to a mechanical device or heart transplant. There are new uses of VA-ECMO that are creating controversy as well as ethical dilemmas. Initiating VA-ECMO during cardiac arrest is on the rise, resulting in a survival rate of 29% adults and 42% for pediatrics and neonates.[12] The University of Maryland Medical Center's R. Adams Cowley Shock Trauma Center is implementing a relatively new and supremely inventive modality of VA-ECMO in patients with profound hypovolemia due to cardiac arrest from trauma. This is referred to as emergency preservation and resuscitation for cardiac arrest from trauma (EPR-CAT).[13] The goal is to rapidly cool trauma victims suffering from cardiac arrest from bleeding with a large quantity of ice-cold sodium chloride to bring them to a temperature below 10°C. This enables surgical control of bleeding followed by resuscitation and rewarming with VA-ECMO.[13] In an attempt to facilitate organ donation for transplant, the use of both VA-ECMO and VV-ECMO may also be considered in an attempt to preserve a patient who has tested positive in a brain death examination.[14]

Respiratory Care: Prevention of the Initiation of ECMO

Respiratory care practitioners (RCPs) play a vital role in the treatment, management, and daily care of patients under consideration for both VA-ECMO and VV-ECMO. This is no surprise, given that these are some of the most critically ill patients in any facility. All options for advanced mechanical ventilation and high-flow oxygen therapy should be investigated and implemented as necessary, in preventing the initiation of ECMO. As RCPs, we are compelled to not only treat this subset of patients but also to work diligently to prevent, as much as is possible, the progression of the patient's disease state. Prevention of ARDS with the utilization of lung-protective strategies that "never give the lung a chance to collapse" is critical in patient outcomes and in reducing mechanical ventilator length of stay.[15] Current ARDS treatment guidelines include lung-protective ventilation to minimize ventilator-induced lung injury, monitoring of driving pressure, use of optimal PEEP, administration of neuromuscular blockades to prevent patient self-inflicted lung injury, and utilization of airway pressure release ventilation – time constant adaptive ventilation.[16-22] Early identification, treatment, and implementation of these strategies are key!

Complications and "The Bridge to Nowhere"

As health care providers, we must carefully consider the "why" with regard to initiation of ECMO. Indications and contraindications for any treatment promote the ethical values of beneficence and non-maleficence. We must be responsible in the decision-making process and have supreme confidence in the patient being able to successfully navigate the ECMO process. Initiating ECMO on a patient without a definitive plan or an exit strategy is ethically, morally, emotionally, and fiscally irresponsible. Before any initiation of ECMO, the multi-disciplinary team must consider the goal of providing a bridge to recovery, a bridge to transplantation, or a bridge to a mechanical device. The team must also discuss that if the course and goals of ECMO should fail, what new avenue of patient care will be required. Placing a patient on ECMO with hopes of recovery, transplant, or bridge to a mechanical device does not always go as planned. At times, these patients can become even more critically ill, so much so that it precludes them from the very life-saving intervention they require. In regards to the selection process for ECMO, it has been said, "If you have someone who is dying in front of you, it's really hard to step back and think about it."[22] In such cases, the bridge no longer becomes one to recovery, transplant, or a mechanical device — the bridge no longer exists. The patient is too critically ill for further interventions and also too critically ill to be removed successfully from ECMO. Even with the best of intentions, in certain cases we have created a bridge to nowhere for these patients.

An exit strategy is essential in the plan of care before placing a patient on ECMO. Should the strategy fail, we must be prepared to make the difficult decision to discontinue ECMO on patients who are alert and responsive. Before the advent of mechanical medical devices, including mechanical ventilation, a patient who did not have heart and lung function was considered to have expired.[24,26] Now, mechanical medical devices prevent patients without viable heart and lung function from expiring. "Most physicians practicing in the United States are not legally protected in withdrawing life support unless the patient has advanced directives supporting this action or a healthcare surrogate who requests withdrawal."[26] This is a substantial dilemma. Therefore, a comprehensive strategy must be developed for each patient placed on ECMO. "ECMO is a fantastic example of 'just because you can, doesn't mean you should.'"[24]

Tips and Best Practices in Developing ECMO Strategies

ECMO centers that have a high volume of cases have been shown to improve outcomes.[27] These ECMO centers typically have a select team of ECMO specialists, respiratory therapists, nurses, and licensed independent practitioners and physicians who also contribute to the success of the program. It is important to have an ECMO education plan or training program for staff and to provide the service on a regular basis. This will develop the required knowledge, skills, and understanding of the intricacies and challenges associated with ECMO. All ECMO programs must use evidence-based best-practice strategies based on data from the Extracorporeal Life Support Organization (ELSO); however, these programs must also include innovative, creative thinkers willing to use thoughtful, original methods to push forward the envelope of ECMO therapy.

The ELSO is an international non-profit organization that maintains a registry of ECMO patient data. As ELSO collects and analyzes data, the knowledge base surrounding the success of ECMO continues to increase. Historically, neonatal ECMO has been more successful and is more commonly implemented, therefore, ELSO has a number of years of data listing the survival rates in the neonate population. Scoring tools assist centers with the selection of neonatal, pediatric, and adult patients for both VA-ECMO and VV-ECMO. Examples of the scoring tools are RESP and SAVE Score for adults; PIPER score, NEO-RESCUERS, CDH Pre-ECMO, CDH On-ECMO for neonatal patients; and P-PREP, and PED-RESCUERS for pediatrics.[28]

Conclusion

ECMO is a significant undertaking in critical care medicine, providing immense benefits while consuming vast resources. As health care providers, it is easy to overlook the fiscal responsibility of our work due to

the fact that the product of our efforts is human life. ECMO changes the rules of health care. It pumps life into patients who otherwise would not survive. The decision to initiate ECMO is extremely complex and at times unwelcome. Moving forward, there must be multi-disciplinary meetings discussing all aspects of the use of ECMO. The predicted outcome, plan of care, potential complications, ethical dilemmas, expected resources required, and the patient's ability to maintain a commitment to follow-up medical care are some of the many factors to consider. Frequent meetings and conversations to update, in real time, the patient and family on the progress of care are essential. The course of ECMO and how it is to be utilized in the future is yet to be determined. In many respects, ECMO is uncharted territory. It is paramount that any medical team charged with the decision-making process ensure that the use of ECMO is a bridge to recovery or a bridge to transplant and not to a proverbial bridge to nowhere.

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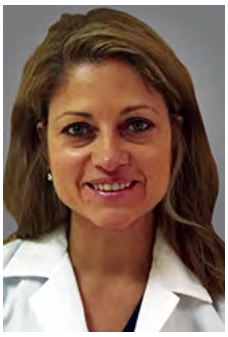

Maria Madden MS, RRT-ACCS, Research Coordinator at University of Maryland Medical Center/R Adams Cowley Shock Trauma and Clinical Specialist at ICON.

Marlin Martin RRT-ACCS, Supervisor, Respiratory Care Services and ECMO Specialist at University of Maryland Medical Center/R Adams Cowley Shock Trauma.

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RTs on the Front Line

by Thomas Kallstrom, MBA, RRT, FAARC

It is early April in 2020 and, as we've all experienced, things changed, and they changed dramatically. Yet, through all this, there is one thing that matters most of all and that is you and your patients. You are all on the forefront of our minds.

We respiratory therapists have seen a lot of things in our 73-year history, but nothing like this. The closet thing that I can relate to might be in the late 70s when hospitals had to expand their ICUs to manage an onslaught of patients presenting with Guillain Barre who required mechanical ventilation due to adverse reactions to the vaccination. I recall working with a fleet of blue MA-1s taking over the ICU.

Of course, that is where the comparison ends. This is a pandemic and we are all at risk.

COVID-19 as we know is a respiratory disease that is wreaking havoc throughout the world. Thankfully in the United States we have dedicated professional respiratory therapists who are at ground zero. Because we provide aerosol delivery, suction, and, in many cases, intubate the patient we are exposed in a very close manner.

There has been a lot of attention directed at the bedside respiratory therapist in the media lately. Over a 10-day period once the virus started to gain attention the executive office was and still is inundated by requests for interviews or questions that need answers from journalists. As a result, the general public is seeing for the first time what a respiratory therapist is. This is good but not necessarily the way we would have wanted it.

Most of the questions we receive from these journalists revolve around the shortage of ventilators and the role of respiratory therapists. Several ventilator manufacturers are ramping up, the federal stockpile ventilators are being requested, and we are seeing industry develop new brands of ventilators as well.

The AARC released a joint statement that addressed the use of mechanical ventilators with multiple patients being ventilated with one ventilator.

PPE is essential when on the job. And staying healthy on and off the job is essential Check our COVID-19 News & Resources page often for updates to help you. We encourage you to share this information with your colleagues and communities.

Please take care of yourself and your family. The AARC is still working hard to be a resource and a voice for you. You can rest assured about that. Thank you for all the work you are doing in this unique time in our history.

about the author…

Thomas J. Kallstrom, MBA, RRT, FAARC, is executive vice president of the ARCF and executive director of the AARC.

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Keep Calm, Keep True, Keep Delivering Quality Care

by Anthony L. DeWitt, JD, RRT, FAARC

Therapists may rightly wonder what the impact of COVID-19 is on the legal responsibilities they carry in the profession. While much remains unknown at this point, there are reasons to be concerned that early knowledge is not complete knowledge and may carry with it the potential for liability. Generally speaking, however, if people follow the recommendations of the Centers for Disease Control and Prevention (CDC) and act in a reasonable manner, courts are going to be hard-pressed to find any liability.

A developing understanding

Early on, COVID-19 was thought to have only a 14-day incubation period, and if a person was able to go more than 14 days without coming down with the virus, they were "safe." Recent events have called that theory into question.

For people who enjoy thrillers by authors like Stephen King and Dean Koontz, you can find plenty on the internet to scare you to death about this virus. But in truth, it isn't the bubonic plague, SARS, or even MERS. It's a virus. It isn't well understood, but according to the New England Journal of Medicine, no one under 15 has yet acquired the disease. It tends to be an opportunistic pathogen, attacking the elderly and those with compromised immune systems.

Newer evidence suggests the incubation period may be longer than 14 days, and that people who have cleared symptoms may nonetheless be infectious. Because what you do not know can literally drag you into court someday, some best practices are being devised as you read this to help with the containment of the pathogen.

Act reasonably

It is important to remember that the law does not require perfection of professionals, and, in fact, often settles for a lot less. As I frequently remind people, a person can make a reasonable deduction from the evidence at hand and still be wrong. Once we know the result, the temptation is to believe that the process was flawed. That's rarely the case, however, and courts require strict proof of causation. Just because the patient suffered a bad outcome doesn't mean that the care team did anything unreasonable. That's especially true if they acted on the best information they had at the time. The key term in tort law

is “reasonable,” as in a “reasonable person in the same or similar circumstance.” So long as a health care practitioner acts reasonably, they are unlikely to be sued successfully.

Don’t let fear drive

During the Great Depression, Franklin Roosevelt told the country that the only thing it had to fear was “fear itself.” It is precisely at times like this that those of us in the scientific and legal communities cannot and should not be driven by fear. If you operate using the best guidance from the CDC you are likely to be in good shape because it is reasonable to trust that entity to provide accurate, timely information that is scientifically validated.

Unfortunately, while FDR told us about “fear itself,” our history in World War II is perhaps more revealing when it comes to combatting fear. The government rounded up thousands of Japanese-Americans and detained them while leaving thousands of German-speaking Missourians alone. Fear can, in other words, make people unreasonable.

A brief review of pundits on social media suggests that people should be quarantined somewhere between 30 days and the rest of their lives. People are suggesting that infected cruise ships be sunk and that all foreign travel be stopped. This kind of fear-driven response is precisely the kind of thing that actually causes legal troubles for people.

Stay grounded in the facts

Facts and data do not care how you feel about them, and that doesn’t make them any less factual. Being responsive to the reasonable risks while taking reasonable precautions is the right mindset. Panic is not pretty, nor is it called for.

Since COVID-19 first showed up on the scene, the people at My Patriot Supply, a company that sells 30-, 60- and 90-day food supplies in plastic buckets, have been swamped with orders. FedEx and UPS have reported that they are delivering more dehydrated food nationwide than other goods, and it is mostly because people refuse to listen to science.

Managers need to make sure to share information from the CDC and counsel staff to remain calm. Universal precautions already protect most health care workers, and simple hand-washing and infection-control techniques are the best means of controlling these kinds of outbreaks.

Deliver quality patient care

In short, to limit your legal risk, limit your actions to those prescribed by the CDC. Don’t quarantine patients longer than necessary, and be compassionate and communicative with patients and their families.

As therapists, you are on the front lines. You are the infantry in this battle against a virus that produces primarily respiratory symptoms. Protect yourself, and disseminate the science along with a kind word now and then.

Remember my golden rule: People do not sue people they like. And everyone loves a good respiratory therapist!

about the author…

Anthony L. DeWitt, JD, RRT, FAARC, is an attorney and a partner in the firm Bartimus, Frickleton, 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.

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RC Currents

IN THE NEWS

First Person-to-Person Transmission of COVID-19 in the U.S.

A study published in *The Lancet* in March details the first person-to-person transmission of COVID-19 in the United States. According to the investigators, a woman in her 60s who had recently travelled to China transmitted the infection to her husband. Despite active monitoring and testing of contacts of both cases, no further transmission was detected.

Of the 372 individuals identified as potential contacts, 347 were actively monitored after confirmation of exposure to the woman or her husband on or after the day of symptom onset. This included 152 community contacts and 195 health care professionals. Twenty-five people had insufficient contact information to complete active monitoring. A convenience sample of 32 asymptomatic health care personnel contacts were also tested.

The 347 contacts underwent active symptom monitoring for 14 days following their last exposure. Of these, 43 contacts who developed fever, cough, or shortness of breath were isolated and tested for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as were the asymptomatic health care professionals. All 75 individuals (ie, 43 symptomatic and 32 asymptomatic) tested negative for SARS-CoV-2.

Both patients recovered and were discharged to home isolation, which was lifted 33 days after the woman returned from Wuhan and following two negative tests for SARS-CoV-2 taken 24 hours apart.

“This report suggests that person-to-person transmission of SARS-CoV-2 might be most likely to occur through unprotected, prolonged exposure to an individual with symptomatic COVID-19,” said study author Dr. Jennifer Layden, chief medical officer of the Chicago Department of Public Health. “Our experience of limited transmission of SARS-CoV-2 differs from Wuhan where transmission has been reported to occur across the wider community and among health care professionals, and from experiences of other similar coronaviruses.”

COVID-19 Incubation Period

A new study led by investigators from Johns Hopkins has put the median incubation period for COVID-19 at 5.1 days, suggesting that the CDC’s recommendation for a 14-day quarantine period is reasonable for anyone exposed to the virus. The analysis was based on 181 cases from China and other countries that were detected prior to Feb. 24 and were reported in the media and included likely dates of exposure and symptom onset. The study estimates that about 97.5% of people who develop symptoms of severe acute respiratory syndrome coronavirus 2 infection will do so within 11.5 days of exposure, and for every 10,000 individuals quarantined for 14 days, only about 101 would develop symptoms after being released from quarantine. The study was published online by the *Annals of Internal Medicine* in March.

How Long is Coronavirus Stable on Surfaces, in Aerosols?

Researchers from the NIH, CDC, UCLA, and Princeton University have quantified how long the COVID-19 virus remains stable in aerosols and on surfaces. Their study reported that severe acute respiratory

syndrome coronavirus 2 (SARS-CoV-2) was detectable in aerosols for up to three hours, on copper for up to four hours, on cardboard for up to 24 hours, and on plastic and stainless steel for up to two to three days.

The NIH study attempted to mimic the virus being deposited from an infected person onto everyday surfaces in a household or hospital setting through coughing or touching objects. The scientists then investigated how long the virus remained infectious on these surfaces. The scientists highlighted these additional observations from their study —

• If the viability of SARS-CoV-1 and SARS-CoV-2 is similar, why is SARS-CoV-2 resulting in more cases? Emerging evidence suggests that people infected with SARSCoV-2 might be spreading virus without recognizing, or prior to recognizing, symptoms. This would make disease-control measures that were effective against SARS-CoV-1 less effective against its successor.

•In contrast to SARS-CoV-1, most secondary cases of virus transmission of SARS-CoV-2 appear to be occurring in community settings rather than in health care settings. However, health care settings are also vulnerable to the introduction and spread of SARS-CoV-2, and the stability of SARS-CoV-2 in aerosols and on surfaces likely contributes to transmission of the virus in health care settings.

The study was published by *The New England Journal of Medicine* in March.

Potential Targets for Coronavirus Vaccine Identified

A team of researchers at the La Jolla Institute for Immunology, working in collaboration with researchers at the J. Craig Venter Institute, have provided the first analysis of potential targets for effective immune responses against the novel coronavirus. The researchers used existing data from known coronaviruses to predict which parts of SARS-CoV-2 are capable of activating the human immune system.

“Vaccine strategies that specifically target these regions could generate immunity that’s not only cross-protective but also relatively resistant to ongoing virus evolution,” said study author Alessandro Sette.

The study was published online by *Host, Cell and Microbe* on March 16.

Risk Factors for Poor COVID-19 Prognosis

An observational study of 191 patients with confirmed COVID-19 from two hospitals in Wuhan, China, published in *The Lancet* last March identified several risk factors for poor prognosis.

The analysis included all adults aged 18 or older with laboratory-confirmed COVID-19 who had been discharged or died by Jan. 31, 2020. The median age of the patients was 56 years, 62% were men, and 48% had underlying chronic conditions, with the most common being high blood pressure and diabetes. From illness onset, the median time to discharge was 22 days, and the average time to death was 18.5 days.

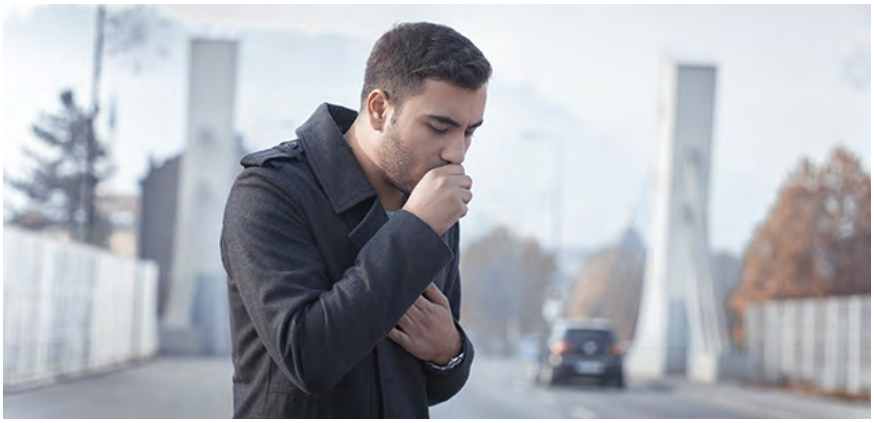
Compared with survivors, patients who died were more likely to be older (average age 69 years vs. 52 years) to have a higher score on the Sequential Organ Failure Assessment indicating sepsis, and to have elevated blood levels of the d-dimer protein on admission to hospital. Additionally, lower lymphocyte count, elevated levels of interleukin 6, and increased high sensitivity troponin I concentrations were more common in severe COVID-19 illness. Respiratory failure, sepsis, and secondary infections were also higher in those who died than in survivors.

The authors noted that their study had several limitations. Because they excluded patients still in the hospital as of Jan. 31, 2020, and thus looked at relatively more severe disease at an earlier stage, the number of deaths does not reflect the true mortality of COVID-19. They also point out that not all laboratory tests were done in all patients, so their exact role in predicting in-hospital death might be underestimated. Finally, a lack of effective antivirals, inadequate adherence to standard supportive therapy, and high doses of corticosteroids, as well as the transfer of some patients to hospital late in their illness, might have contributed to the poor outcomes in some patients.

COVID-19 Immune Response

Australian investigators who mapped immune responses from one of their country's first COVID-19 patients shared the results in a paper published by *Nature Medicine* in March. The researchers tested blood samples at four different time points in an otherwise healthy woman in her 40s who presented with COVID-19 and had mild-to-moderate symptoms requiring hospital admission. "Three days after the patient was admitted, we saw large populations of several immune cells, which are often a tell-tale sign of recovery during seasonal influenza infection, so we predicted that the patient would recover in three days, which is what happened," said study author Dr. Oanh Nguyen.

The researchers believe this finding is a big step forward in understanding what drives recovery from COVID-19 and will be helpful in finding an effective vaccine. It will also help investigators better understand the immune response in larger COVID-19 cohorts and why some people do not mount an effective response and succumb to the disease.



Climate May Play Role in COVID-19 Spread

According to researchers from the University of Maryland's Institute of Human Virology, COVID-19 will most likely follow a seasonal pattern similar to that which is seen for seasonal flu and other respiratory viruses. The investigators based that finding on weather-modeling data in countries where the virus had taken hold and spread within the community at the time of their study. Specifically, they noted that all cities experiencing significant outbreaks of COVID-19 have very similar winter climates, with an average temperature of 41–52° Fahrenheit and an average humidity level of 47–79%. These cities also share a narrow east–west distribution along the same 30–50 N latitude. The areas of the world included in that scenario are Wuhan, China, South Korea, Japan, Iran, northern Italy, Seattle, and northern California.

"Based on what we have documented so far, it appears that the virus has a harder time spreading between people in warmer, tropical climates," said study leader Mohammad Sajadi, MD. "That suggests once average temperatures rise above 54° Fahrenheit — 12° Celsius — and higher, the virus may be harder to transmit, but this is still a hypothesis that requires more data."

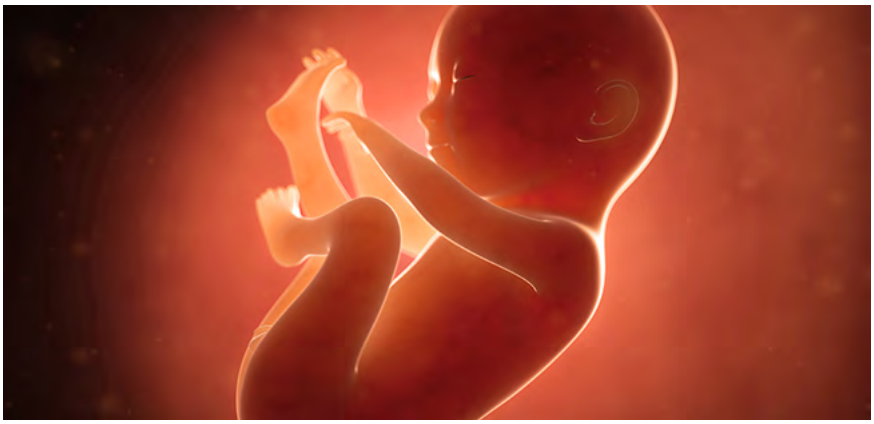
The study was published on the open-data site SSRN in March.

Minority-Serving ICUs Fall Short

Do minorities get the same level of care in the nation's ICUs as their white counterparts? According to a new study lead by an investigator from Beth Israel Deaconess Medical Center, the answer is not always.

John Danziger, MD, MPhil, and his colleagues looked at trends in ICU mortality and length of stay in more than 200 hospitals across the United States, comparing outcomes for hospitals where African Americans and Hispanics made up more than 25% of the ICU population with those where they made up less than 25%. While a steady annual decline in ICU deaths of 2% was seen in the non-minority hospital ICUs, no decline was seen in the ICUs of hospitals defined as minority-serving. Those hospitals also reported longer lengths of stay and more critical illness hospitalizations. For critically ill African Americans treated in non-minority-serving hospital ICUs, the annual decline in mortality was 3% vs. 0% in the minority-serving facilities.

"Although our analysis does not resolve the reasons for differences in outcomes, it identifies minority-serving hospitals as an area of great need," said Dr. Danziger. "Focusing research efforts to further address these inequalities is critical in mitigating the disadvantages minorities face and ultimately closing the health care divide." The study appeared in a recent edition of the *American Journal of Respiratory and Critical Care Medicine*.



The Lung Microbiome Appears Early in Fetal Development

Previous studies have shown that the lungs of newborn infants are already colonized with bacteria. A new study conducted by investigators from the United States and Singapore reports that colonization occurs as early as the first trimester.

The researchers reached that conclusion after analyzing 31 samples of lung, placenta, and intestine tissue from fetuses between 11 and 20 weeks of gestation at labs in Singapore and the University of Alabama at Birmingham (UAB). Bacterial DNA was found in all the samples. The initial analysis in Singapore showed 48 unique taxa in the lung samples, 11 unique taxa in placenta samples, and 24 shared taxa. Analysis of the same samples at UAB showed two separate human fetal lung microbiome groups based on fetal age, one group at 11–15 weeks' gestation and the other at 16–20 weeks' gestation. The two gestational age groups showed a significant change in microbiome diversity with time.

The investigators believe these findings may one day translate to new fetal treatments.

"We speculate that maternal-fetal microbial DNA transfer — and perhaps of other microbial products and whole live or dead bacteria — is a realistic possibility," said UAB Associate Professor Charitharth Vivek Lal, MD. "This may serve to 'prime' the developing innate immune system of the fetus and help in establishment of a normal host-commensal relationship."

The study was published in the *American Journal of Respiratory and Critical Care Medicine*.

Noninvasive Ventilation at Home Gets Thumbs Up

Mayo Clinic investigators publishing in a recent issue of *JAMA* make the case for greater consideration of in-home noninvasive ventilation therapy for patients with COPD. Their meta-analysis of scientific studies conducted on the therapy found use of a noninvasive ventilator device, such as bilevel positive airway pressure, compared to no device was significantly associated with lower mortality, 29.2% vs. 22.3%, and led to fewer emergency department visits and hospitalizations. Lower rates of intubation were also seen in patients who had to be admitted to the hospital.

The authors included 33 previous studies involving more than 51,000 patients in their report. All were conducted among patients with COPD and hypercapnia who were followed for at least one month while using a noninvasive ventilator at home during sleep. While the authors stressed that more study is needed on the value of in-home noninvasive ventilation for COPD patients, they believe these findings show promise for the therapy.

"Patients with COPD should talk with their physicians to determine whether a breathing device such as a BiPAP machine might be a good choice for them," said study author Michael Wilson, MD. "For many patients, such a device may offer important benefits."

Cost of Care High for Older Adults with Delayed OSA Diagnosis

A new study in the *Journal of Clinical Sleep Medicine* suggests more should be done to ensure older adults at risk for obstructive sleep apnea (OSA) are diagnosed and treated as early as possible. In a review of a national sample of Medicare claims data, investigators from the University of Maryland School of Medicine found Medicare beneficiaries age 65 and older who went undiagnosed with OSA over a 12-month period had more doctor's appointments, emergency room visits, and hospital stays prior to being treated for the disorder. They also averaged nearly $20,000 more in costs per year than those who were diagnosed and treated for OSA. Overall, Medicare patients with OSA were more likely to suffer from other ailments as well, such as high blood pressure, diabetes, heart disease, stroke, and depression.

The investigators believe these findings call for insurers, legislators, and health systems leaders to consider routine screening for OSA in older patients, especially those with medical and psychiatric comorbidities.

Menthol Restrictions Don't Reach Those Who Could Benefit Most

While the FDA has yet to place restrictions on the sale of menthol flavored tobacco and nicotine products, some local governments have enacted them. Unfortunately, new research out of the University of Kentucky indicates that those restrictions are failing to reach the populations that could benefit from them the most, including African Americans. According to lead author Shyanika Rose, PhD, MA, nearly 90% of African American smokers smoke menthol cigarettes, and menthol brands are disproportionately marketed to the African American population.

"As more localities are considering flavored tobacco restrictions, they really need to think about having the strongest restrictions, including bans on menthol cigarettes, to adequately protect public health and reduce these disparities," said Dr. Rose.

The study was published in *Health Promotion Practice* in January.

HRRP's Impact on Mortality May Be Overstated

Investigators from University of Texas Southwestern who analyzed Medicare claims data between 2008 and 2016 suggest that the Hospital Readmissions Reduction Program (HRRP) has not really left patients more vulnerable to earlier mortality, as other studies have indicated.

The research specifically looked at outcomes for patients who received care in observation units and emergency departments in the 30-day period following hospitalization. The overall post-discharge 30-day mortality rates for the three initial diagnoses included in the HRRP were 8.7% for heart failure, 7.3% for acute myocardial infarction, and 8.4% for pneumonia. While patients with heart failure experienced an increase in post-discharge 30-day mortality over the course of the study period, the increase preceded the announcement of the HRRP and was concentrated among patients who sought no post-discharge acute care. Nearly half of these patients had been sent to hospice.

"While observation units and the emergency department were increasingly used as avenues of care in the post-discharge period, there has been no increase in the mortality risk in either setting," said study author Rohan Khera, MD. Dr. Khera believes these findings suggest that some of the increase in mortality seen in other studies may have been due to a transition to end-of-life care following hospitalization. The study was published in *BMJ*.

Reducing Albuterol Use for Bronchiolitis

Despite a dearth of evidence supporting the effectiveness of albuterol in treating bronchiolitis in young children, it is widely used in hospitals across the country. New research from investigators at the Children's Hospital of Philadelphia suggests that use can be significantly reduced with the right plan.

Modified emergency department and in-patient treatment protocols implemented at their facility over three winter seasons explicitly state that bronchodilators are not recommended for infants with a typical presentation of bronchiolitis. Nurses, respiratory therapists, and physicians were educated on the new guidelines, and the electronic health record system was modified to create a "do not order" option that stated bronchodilators were not recommended for routine use.

After implementing the new protocols, albuterol use in infants with bronchiolitis declined from 43% to 20% in the emergency department and from 18% to 11% in in-patient settings, preventing more than 600 infants from receiving an unnecessary treatment. Patient admission rates, length of stay, and revisit rates were not affected by the change. The study appeared in a recent edition of *Pediatrics*.

Critical Care Resuscitation Unit Speeds Care

In 2013, the University of Maryland R. Adams Cowley Shock Trauma Center established the nation's first Critical Care Resuscitation Unit (CCRU) to speed up the care received by patients suffering from life-threatening health conditions who needed to be transferred to a high level of care. Now they've analyzed outcomes for patients who were treated in that unit during its first year of operation.

The study compared results for 1,565 critically ill patients, 644 of whom were treated in the CCRU. The remaining patients were admitted from the emergency departments of outlying hospitals to traditional ICUs at the hospital in 2012 and 2013. The researchers found that the average time to get into an ICU after a transfer request was filed was 108 minutes for CCRU patients vs. 158 minutes for the control group of patients who were transferred in 2012 and 185 minutes for those transferred in 2013. Among CCRU patients requiring emergency surgery, the surgery was performed about 3.5 hours on average after they arrived at University of Maryland Medical Center compared to 6–7 hours after arrival for those in the control group. After controlling for variations in the severity of disease and care, the researchers found that the CCRU patients were 36% more likely to survive than those in the control group.

Procedures performed in the CCRU range from massive blood transfusions and dialysis to continuous electroencephalogram monitoring of the brain and organ support with a heart-lung machine. The authors hope the findings in their study will convince other hospitals to consider adopting the CCRU model. The study was published in a recent edition of the *Journal of Emergency Medicine*.

Genetic Anomaly Linked to Treatment Failure Leading to Severe Asthma

Researchers from the Cleveland Clinic identified a genetic anomaly that causes patients with asthma to respond poorly to glucocorticoids, thus putting them at greater risk for severe asthma. They believe patients with the variant, dubbed *HSD3B1(1245A)*, may benefit from other treatments instead.

The study involved a retrospective analysis of the association between patient genomes and lung function in more than 500 asthmatic patients who received daily oral glucocorticoids treatment or no glucocorticoids. Previous studies had shown that *HSD3B1* encodes an enzyme that converts less active hormones called androgens into more powerful androgens. While additional research is necessary, the team suspects that *HSD3B1(1245A)*'s effect on lung function may be attributed to inhibition of this process.

"This study is the first to provide genetic evidence suggesting that variants related to androgen synthesis affect glucocorticoids treatment resistance in asthma or any other inflammation-related disease," said study author Joe Zein, MD. "These findings provide us with important new information that may lead to more tailored treatments for asthma patients and the ability to prevent the development of severe disease."

The study appeared in a recent edition of the *Proceedings of the National Academy of Sciences*.

More Evidence Lung Cancer Screening Works

Results from the NELSON Trial — a long-awaited study conducted in Europe — add to the evidence showing lung cancer screening saves lives. Published in The *New England Journal of Medicine* earlier this year, the study reported that people who underwent computed tomography screening for lung cancer had a 24% reduction in mortality. The reduction was 33% for women. This occurred along with a very low referral rate for false positives of 2.1%. The NELSON Trial complements previous findings from the National Lung Screening Trial, which was conducted in the United States and published in 2011.

Pediatric Observation Unit Keeps Kids Out of the Emergency Department

A pediatric observation unit (POU) located adjacent to the pediatric emergency department (PED) may reduce length of stay and in-patient admissions, report researchers from the Mount Sinai Health System who established such a unit at Mount Sinai Beth Israel in New York City.

The unit was developed to handle children who come to the PED for non-urgent care. During their two-year study, 41% of the children seen in the PED-POU were suffering from respiratory conditions. In 2017, the average length of stay was 25.7 hours, and this dropped to 26.5 hours in 2018. Both were significantly below the goal of less than 48 hours. During the first year of the trial, 18.7% of patients had to be admitted to the PED. In year two, that dropped to 13.1%, well below the 15% target. The PED-POU ranked in the 92nd percentile on the Press Ganey patient satisfaction question, "Likelihood to Recommend." That compared to a 36th percentile ranking for the PED prior to the opening of the PED-POU.

The study was published in a recent edition of *BMJ Open Quality*.

New Hope for RSV Vaccine?

Researchers from The Ohio State University believe they may have uncovered how the human metapneumovirus (HMPV), which is in the same family as the respiratory syncytial virus, hides from the immune system. Specifically, HMPV capitalizes on a common modification of its RNA that enables the virus to use host cells to copy itself and cause infection. When the investigators blocked the RNA modification in cell studies, they found that the virus unexpectedly activated a stronger-than-normal innate immune response. They then tested the modification in cotton rats, finding that the mutant virus produced a higher amount of type I interferon and triggered a higher antibody response and a higher T-cell immune response.

"That means you've triggered higher protective ability against the virus infection. So, mutating the virus enhances vaccine efficacy," said study author Jianrong Li. "That is exactly what we want. We proved a concept that these mutant viruses are improved vaccine candidates for HMPV."

The study was published earlier this year in *Nature Microbiology*.

An E-Cig By Any Other Name

Do children who use e-cigarettes always realize they are using e-cigarettes? According to researchers from Rutgers who led a study aimed at finding out how many kids are using these devices, the answer may be no. Their results show many kids who use the Juul brand of e-cigarettes don't identify as e-cigarette users simply because, to them, it's called "Juuling" instead.

The study was based on a tobacco-focused survey of 4,183 public high school students in New Jersey taken in 2018. When the investigators added Juul-specific questions to assess e-cigarette use, they found high school students reported higher use. In some cases, the addition of Juul resulted in dramatic increases, particularly for female students and black students. For example, e-cigarette prevalence nearly doubled among black students when Juul use was included.

"We've suspected that the brand Juul contributed to the increase of e-cigarette use among teens, but I think we were surprised at the extent of the brand's popularity among young people," said study author Mary Hrywna. "We need to think more carefully about how future questions are constructed when assessing e-cigarette use among teens."

The study was published in *JAMA Network Open* earlier this year.

Measuring Cardiorespiratory Fitness With Wearables

Measuring cardiorespiratory fitness via the V_{O2max} test requires patients to exercise to exhaustion using specialized equipment in a medically supervised setting. An international team of investigators publishing in the *Journal of Applied Physiology* believe data captured by wearable fitness trackers during daily life could reduce the need for this testing in some individuals with low exercise tolerance.

The study was conducted among healthy adult volunteers between the ages of 18 and 55 who first underwent a cycling test to measure their V_{O2max}. The researchers then measured their height, weight, fat, and muscle mass and fitted them with a chest strap heart monitor and an activity monitor worn around the wrist. The volunteers were directed to wear the devices continuously during daytime hours for five consecutive days as they followed their typical daily routines.

Using a fitness index to calculate the relationship between energy expenditure and heart rate during physical activity, the researchers predicted V_{O2max} for each of the volunteers. Comparing the estimated V_{O2max} with the true values from the cycling test, the margin of error was approximately 10%, which was lower than the mean error rate reported in previous research using submaximal methods to measure cardiorespiratory fitness.

The authors believe these findings suggest that the method used in their study can help predict cardiorespiratory fitness.

"Future work should focus on extending the validity of the presented method with data to groups of elderly and patients," they wrote.

Discovery May Protect Premature Infants From Developing Lung Infections

Researchers from Cincinnati Children's Hospital have discovered a complex biological process that they believe may one day lead to new treatments aimed at reducing the risk of respiratory infections in premature infants. Specifically, they found that bacteria from the gut stimulate the production of Type 3 innate lymphoid cells in early alveolar cells called fibroblasts via production of a hormone called insulin-like growth factor 1 (IGF1), which orchestrates expansion and maturation of early pulmonary innate lymphoid cells. Deleting pulmonary IGF1 in the lungs of baby mice interrupted the biogenic development of Type 3 innate lymphoid cells and made the mice susceptible to lung infections and pneumonia.

"This study gives us important new information that helps us develop new and cost-effective methods to boost innate lung immunity in preterm babies," said study author Hitesh Deshmukh, MD, PhD. "This could help them develop lifelong pulmonary resistance to respiratory infections.''

The study was published in a recent edition of *Immunology*.

Smartphones Beat Wearables

Tracking physical activity via a patient's smartphone may be more effective than tracking it via a wearable device, report researchers from Penn Medicine. In a study that compared outcomes among 500 patients assigned to either smartphone tracking or wearable device tracking, they found significantly higher adherence rates over time for smartphone tracking. By the six-month point, 61% of the patients in the smartphone group were still transmitting their data compared to just 47% of those in the wearable device group. What could account for the difference? The researchers believe smartphones performed better because people already carry them wherever they go, and they aren't likely to change that behavior. The study appeared in a recent edition of *JAMA Open Network*.

Disinfecting Parents Reduces *S. Aureus* Risk in Infants

Reducing the risk of *Staphylococcus aureus* in premature infants can be accomplished by doing more to ensure their parents are not infected with the bacteria, find Johns Hopkins investigators publishing in a recent edition of *JAMA*. They arrived at that conclusion after testing a new infection-control strategy on the parents of 190 newborns admitted to two neonatal ICUs. Each of the infants had at least one parent who tested positive for *S. aureus* when screened at the time of their child's entry into the neonatal ICU.

The parents of 89 babies self-administered an antibiotic nasal ointment twice a day for five days and cleaned designated skin areas with antiseptic wipes for the same time period. The remaining 101 parental couples used identically packaged placebo treatments of petroleum jelly and non-antiseptic wipes. Forty-two of the infants, or about 22%, acquired *S. aureus* that matched bacteria recovered from either their mother or father, or from both parents, and four had MRSA strains acquired from a parent. Only about 15% of infants whose parents were given the antibiotic ointment and antiseptic wipes had parentally acquired bacteria vs. about 29% of those who were given the sham treatments.

Strange but True . . .

Another reason to get the flu shot? Most cancerous tumors are considered "cold" — meaning they don't contain many immune cells, or they have cells that suppress the ability of the immune system to fight them. Researchers from Rush University Medical Center believe they may have found a way to turn these cold tumors into hot ones: inject them with an influenza vaccine. They tried it in the skin melanoma of mice and found it either made the tumors grow more slowly or shrink.

Your breath will decide: What could breathing possibly have to do with the exercise of free will? Swiss researchers have linked the "readiness potential" — defined as a signal of brain activity in the human cortex that appears not only before voluntary muscle movement but also before you even become aware of the intention to move — and the breathing pattern. Specifically, you are more likely to exercise your free will to do something when you exhale than when you inhale. The finding could be used in everything from predicting consumer behavior to treating deficits in voluntary action control such as those seen in Parkinson's disease.

Say cheese: Taking the pulse or checking the breathing rate of wild animals usually requires sedation, but if new research out of Australia holds up, these animals may one day be monitored simply by high-resolution digital cameras. Investigators there found that these cameras can pick up tiny movements in the chest cavity indicative of heart beat and breathing from 40 meters away.

Contribute to the AARC "Transitions" Column

The AARC "Transitions" column is devoted to sharing news about the passing of AARC members. Submit news about your colleagues' recent passing using our Transitions online form. 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.

Tell Your Story

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 them. Send your story to heather.willden@aarc.org

Industry Watch

FDA clears patient-specific airway stents developed at the Cleveland Clinic
The FDA has cleared patient-specific airway stents developed by Cleveland Clinic physician Tom Gildea, MD. The patient-specific stents are designed using computed tomography scans and proprietary 3D visualization software. The molds for the stents are then printed using a 3D printer and injected with medical-grade silicone. This process allows them to perfectly fit a patient's anatomy. Until now, the patient-specific devices were being implanted under FDA's compassionate use program, which allows patients who have failed all available forms of treatment to receive investigational treatments not yet available to the public.

Partnership to drive patient adherence to asthma, COPD medications
Signant Health entered into a partnership to connect its TrialMax electronic Clinical Outcome Assessment (eCOA) platform to Propeller Health's digital health platform for asthma and COPD. The partnership expects to help drive patient adherence to inhaled medications by enabling accurate tracking of patients' medication-use events alongside their eDiary data within a single eCOA platform.

"This integration is important in understanding inhaler use and patterns in patients with respiratory illnesses," said Signant Health VP of Product Strategy & Innovation Bill Byrom. "The addition of the Propeller sensor within TrialMax's ecosystem of connected wearables and sensors provides a frictionless way to collect medication usage data without requiring additional actions by the patient."

Vyaire names new CEO
Gaurav Agarwal has been appointed to serve as the new CEO of Vyaire Medical, Inc. Agarwal succeeds Dave Eckley, who will remain on the company's board of directors. Agarwal brings extensive global leadership experience in medical devices to the job, along with a proven track record in driving innovation, improving patient outcomes, and creating exceptional value for customers. He comes to the position from KCI, where he served as president and CEO and is credited with transforming the company into a leader in advanced wound care. Prior to that, Agarwal served as president of orthopedic reconstruction at Smith & Nephew, and he has also worked in vice president and general manager positions at GE Healthcare.

First peanut allergy treatment for children approved

The FDA has approved the peanut allergen powder Palforzia to mitigate allergic reactions, including anaphylaxis, that may occur with accidental exposure to peanuts in children. Treatment with Palforzia may be initiated in children between the ages of four and 17 who have a confirmed diagnosis of peanut allergy and may be continued in anyone four years of age and older. Those who take Palforzia must continue to avoid peanuts in their diets.

"Peanut allergy affects approximately one million children in the United States, and only one out of five of these children will outgrow their allergy," said Peter Marks, MD, PhD, director of the FDA's Center for Biologics Evaluation and Research. "Even with strict avoidance, inadvertent exposures can and do occur. When used in conjunction with peanut avoidance, Palforzia provides an FDA-approved treatment option to help reduce the risk of these allergic reactions in children with peanut allergy."

Australian researcher receives fellowship to study remote monitoring in COPD

ResMed and the ATS Foundation have awarded a $100,000 Research Fellowship grant to Claude Farah, PhD, of the Woolcock Institute of Medical Research in Sydney, Australia, to study how remote monitoring can help improve the management of patients with COPD. The aim of Dr. Farah's study is to detect early changes in lung function from daily recordings and to notify patients when they need to begin more intensive treatment or seek medical attention.

"This grant is important as it tests how integration of technology that enables convenient at-home remote monitoring of patients' lung function helps with earlier detection and interventions of COPD exacerbations, aiming to prevent further deterioration in their condition," said Mihaela Teodorescu, MD, MS, chair of the ATS Assembly on Sleep and Respiratory Neurobiology.

Tandem therapy to facilitate treatment of pulmonary conditions

According to Monaghan Medical Corporation, a newly approved combination for two of its products — the Aerobika oscillatory positive expiratory pressure (OPEP) device and the VersaPAP positive airway pressure device — is creating a low-cost, safe, and effective "tandem therapy" that will allow clinicians to treat a variety of pulmonary conditions requiring lung expansion and airway clearance. The overall goal of the tandem therapy is to improve lung volumes by maximizing alveolar recruitment while optimizing airway clearance.

"Green" MDI propellant gets go ahead from FDA

According to Koura, the FDA has issued approval for the company to proceed to clinical trials with Zephex 152a, a new medical propellant that has been under development for several years for use in metered-dose inhalers (MDIs) for treatment of respiratory disorders such as asthma and COPD. Zephex 152a reduces the carbon footprint of an MDI, helping to safeguard an invaluable therapeutic option for patients. Pressurized MDIs using Zephex 152a will bring about a greater than 90% reduction in Global Warming Potential when compared to some current MDI propellants, resulting in an environmental impact comparable to other "green" technologies, including dry powder inhalers.

"Supplying this critical technology to the many millions of patients who suffer from asthma moves the needle on sustainable care and conscientious development throughout our industry," said Koura President Sameer Bharadwaj.

New funding will spur further development of RSV, influenza vaccines

Codagenix, Inc., a clinical-stage biotechnology company developing prophylactic vaccines and oncolytic virus therapies, has announced the closing of a $20 million Series B investment round. The new investment was led by Adjuvant Capital, with participation by Euclidean Capital and Topspin Partners. The funds will be used to support the further clinical development of Codagenix's live attenuated RSV vaccine for the elderly and a broadly protective influenza vaccine, among others.

"Compared to the trial-and-error processes used to develop most live attenuated vaccines, the software-driven virus recoding approach used by Codagenix is exactly the type of next-generation, paradigm-shifting technology we strive to finance at Adjuvant," said Glenn Rockman, managing partner at Adjuvant Capital.

EDS drug approved in Europe

According to Jazz Pharmaceuticals plc, the European Commission has approved Sunosi (solriamfetol) to improve wakefulness and reduce excessive daytime sleepiness (EDS) in adults with narcolepsy (with or without cataplexy) or obstructive sleep apnea (OSA) whose EDS has not been satisfactorily treated by primary OSA therapy, such as CPAP. Sunosi is the first dual-acting dopamine and norepinephrine reuptake inhibitor approved to treat EDS in adults living with narcolepsy or OSA and the only licensed therapy in the European Union for the treatment of EDS in adults living with OSA. Sunosi received FDA approval to improve wakefulness in adult patients with EDS associated with narcolepsy or OSA last March and was designated a Schedule IV medicine by the U.S. Drug Enforcement Agency in June. Sunosi has orphan drug designation for narcolepsy in the United States.

Gene therapy study for asthma gets underway

Hoth Therapeutics, Inc., is collaborating with North Carolina State University on a preclinical study designed to assess the effectiveness of a gene therapy for the treatment of asthma and allergic inflammation. The study has begun the delivery and distribution of nebulized particles that will enable the therapeutic oligonucleotide, short DNA, and RNA molecules that have a wide range of applications in gene testing. Hoth has appointed Dr. Glenn Cruse to its Scientific Advisory Board to oversee the advancement of the company's gene therapy programs.

"Commencement of this initiative is an important step in the development and growth of our company," said Hoth Therapeutics CEO Robb Knie. "Dr. Cruse's expertise as a leading mast cell biologist in allergic and inflammatory diseases will be invaluable for the preclinical development of splice-switching oligonucleotides for asthma."

New treatment for CF patients in the works

Synspira Therapeutics, Inc., signed an agreement with the Cystic Fibrosis Foundation to support the development of SNSP003, Synspira's orally delivered non-porcine enzyme replacement therapy (ERT) designed to treat malabsorption syndromes. SNSP003 could represent the first significant ERT advancement in 40 years with the potential to be the only broad-spectrum, non-porcine product that addresses malabsorption of fat, protein, and carbohydrates. Synspira's oral enzyme-delivery technology is expected to provide a significant advancement over current porcine-based pancreatic ERTs, which have inherent limitations because the porcine pancreas source leads to variable responses, a high pill burden of 15–40 capsules per day, and an inability to provide innovative formulations.

"For more than 20 years, our team has collaborated with the Cystic Fibrosis Foundation on novel therapies to improve the lives of people with CF," said Synspira CEO Robert Gallotto. "Now, with the

Cystic Fibrosis Foundation's support, we can quickly advance SNSP003 and address an urgent unmet need."

FDA issues IND for treatment of rare respiratory disease

According to Inovio Pharmaceuticals, Inc., the FDA has accepted its Investigational New Drug application to evaluate its DNA medicine INO-3107 in a Phase 1/2 trial for treatment of recurrent respiratory papillomatosis, a rare disease caused by the human papillomavirus that can lead to life-threatening airway obstructions and occasionally progress to cancer. Currently, the disease is mostly treated by surgery, which temporarily restores the airway; the tumor almost always recurs, however, and the surgery must be repeated, often multiple times a year. The open-label, multicenter trial will enroll approximately 63 subjects in the United States and will evaluate the efficacy, safety, tolerability, and immunogenicity of INO-3107 in subjects who have required at least two surgical interventions per year for the past three years. The primary efficacy endpoint will be a doubling or more in the time between surgical interventions following the first dose of INO-3107 relative to the frequency prior to study therapy.