



The Division of Pulmonary, Critical Care, Allergy, and Sleep Medicine at the Medical University of South Carolina (MUSC) continues to be recognized nationally for excellence in clinical care, cutting-edge research, and innovative educational programs.

Division faculty and fellows provide services in three Intensive Care Units at MUSC University Hospital, MUSC Ashley River Tower, and the Ralph H. Johnson Veteran's Affairs Medical Center. In response to the COVID-19 pandemic, and in partnership with MUSC Health staff and administration, the division led the establishment of three closed COVID ICUs with processes designed to optimize the care of patients and the safety of providers. Division faculty also care for patients with complex advanced pulmonary diseases in both the inpatient and outpatient settings, as well as perform all state-of-the-art pulmonary procedures.

The division consistently achieves U.S. News & World Report's "high-performing" designation, meaning we rank among the top 25 percent of pulmonary programs in the country. The multidisciplinary programs encompassing lung health remain the cornerstone of success for our division and provide a full range of services from the diagnosis and management of common conditions to state-of-the-art distinguishing technologies to treat the most complex cases.

Our clinical expertise includes critical care, lung nodules/cancer, interventional bronchoscopy, cystic fibrosis, chronic obstructive pulmonary disease (COPD), asthma/emphysema, pulmonary hypertension, lung transplantation, sleep disorders, rare lung diseases, sarcoidosis, allergies, pulmonary rehabilitation, pulmonary function, and remote ICU care via telemedicine.

A major focus of the division is training the next generation of leaders in pulmonary and critical care medicine. The division continues to recruit outstanding fellows into our three fellowship programs: pulmonary and critical care medicine, critical care medicine, and sleep medicine. Additionally, we offer an NIH-funded T32 research training program.

The division supports a broad-based research enterprise from basic to clinical and translational science, working collaboratively to develop novel therapeutic approaches for the treatment of critical illnesses and pulmonary diseases. Areas of particular emphasis include interstitial lung disease, critical illness, lung cancer, cystic fibrosis, and rare lung diseases. The publications, honors, and grant funding received by division faculty this year highlight the quality and ingenuity of work being done in the division to advance cures for pulmonary diseases through scientific discoveries, cutting-edge treatments, and lung transplants.



16
LUNG
TRANSPLANTS
IN 2020

36,369
FY20
OUTPATIENT
OFFICE VISITS

\$14.6M
FY20
RESEARCH
FUNDING



Division of Pulmonary,
Critical Care, Allergy
and Sleep Medicine

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MESSAGE FROM THE INTERIM DIRECTOR



As I write this letter we are in the midst of unprecedented times, a global pandemic due to COVID-19. Over the past 10 months, I have been inspired daily by my team's ingenuity, creativity, and commitment to excellence in the face of this pandemic, as they continue to find innovative solutions to care for our patients, conduct research, and educate our residents and fellows.

During this crisis, the Division of Pulmonary, Critical Care, Allergy, & Sleep Medicine has continued to flourish. In fact, in spite of the many challenges COVID-19 has presented in academic medicine, we have continued to provide health care services using best-practices to protect the health of our patients and care teams. In response to the pandemic, division faculty led the establishment three COVID ICU units and led efforts to build and update clinical practice guidelines for managing COVID-19. Division faculty also provided key institutional leadership with regards to COVID-19 research.

In addition to treating thousands of patients in the critical care and medical wards, we continue to provide state-of-the-art ambulatory care through telemedicine, perform interventional pulmonary procedures for patients with suspected lung cancer, perform lung transplants and address patient needs with dedication and compassion.

Despite the increased demands, our faculty remain committed to the education of trainees and meeting their research commitments. In FY20, the division's aggressive pursuit of external funding was rewarded: 30 new grants were secured and 14 non-competing grants were renewed. Division faculty and fellows have also been actively engaged in leading numerous COVID-19-related clinical trials.

The current times stretch us, but the achievements presented in this report underscore our strength and commitment to meet the challenges of the pandemic and advance our mission to provide exceptional care for all.

Dee Ford, M.D., MSCR

Professor and Interim Director

Division of Pulmonary, Critical Care, Allergy & Sleep Medicine

Department of Medicine

Five Convenient Locations:

Rutledge Tower Pulmonary Clinic

135 Rutledge Ave, 5th Floor
Charleston, SC 29425

Hollings Cancer Center Pulmonary Clinic

86 Jonathan Lucas Street, 2nd Floor
Charleston, SC 29425

Pulmonary Clinic Dantzler

2750 Dantzler Drive, Suite 100
North Charleston, SC 29406

East Cooper Medical Pavilion

1600 Midtown Avenue, 2nd Floor
Mount Pleasant, SC 29464

MUSC Sleep Center

4480 Leeds Place West
North Charleston, 29405

West Ashley Medical Pavilion

2060 Sam Rittenberg Boulevard
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MEETING AN OVERWHELMING CHALLENGE

Critical Care Team Starts with Blue Prints and Collaboration

Written by Kat Hendrix, Ph.D.

The first weeks of the pandemic delivered a small but vital gift to those charged with leading the MUSC response. That gift was time. The novel coronavirus (COVID-19) appeared in California and New York in early March, but it was another month before it reached all 46 counties in South Carolina. That brief lag gave MUSC's team a head-start on designing what would be a successful, although exhausting, response. **Andrew Goodwin, M.D.**, associate professor of Pulmonary & Critical Care Medicine and medical director of the MICU, helped lead the effort that involved multiple areas across the MUSC enterprise. "We realized early on that we had to overhaul the usual ways we provided care. So, first and foremost, we had to get all the right stakeholders in the room. That was when we realized what an overwhelming amount of change it would require to care for our COVID patients and maintain a safe environment for our staff and other patients," says Goodwin.

The departments of pediatrics and obstetrics had moved into the new Shawn Jenkins Children's Hospital in February, making space available in the main hospital for expanded capacity, but the devil was in the details. "The first challenge was that MUSC is an older building and different units share air handlers. To minimize risk of air borne transmission, we had to figure out where we could segregate air flow between areas," says Goodwin. "Every department came together—facilities, operations, emergency management, the ICU—and we literally started by going through air duct blue prints to see where air handling was shared and where it would not circulate out of a COVID area."

After identifying two vacant clinical units with segregated air flow—the pediatric cardiac ICU and a newborn nursery—the team began converting them into COVID treatment areas. Facilities staff, led by **Iggy Pla**, re-engineered them into negative pressure units where air from inside is blown outdoors, while others re-designed processes of care to meet the realities of treating COVID patients.

Treating non-COVID patients was also a concern, since MUSC continued providing care to patients with other medical conditions whose COVID status was unknown. "We had to create work flows to manage patients while we waited for their test results. Again, everyone got together and really thought through how to keep our staff and other patients safe," says Goodwin.

Because the virus was entirely new, a multidisciplinary team was formed to determine what standards of care should be



Dr. Bryan Garcia (right) and PA Elizabeth Poindexter (left) reviewing data during rounds in the COVID ICU.

implemented. "Developing consensus on how to care for these patients was a big initiative," says Goodwin. "Here at MUSC, we believed it was important to develop a plan that didn't abandon good critical care practices—what medications to use, how to use our life support modalities, making sure our patients had access to rehabilitative care as they improved. Fortunately, over the course of the pandemic, we've been able to incorporate new evidence from valid, rigorous studies as it has emerged."

Despite the successful organizational efforts, Goodwin recognizes the intense stress on providers. "I worry most about how much burnout we'll see from this. It's overwhelming to have so many patients who are all so critically ill at once. I worry about the long-term health of all the providers who're dealing with this."

Still, there have been moments of hope when the team sees their dedication and determination pay off. "We've had successes, too" says Goodwin. "Some early reports suggested that 85% of ventilated COVID patients didn't survive—that was terrifying. So, when we extubated our first three patients—when we got them through their respiratory failure and their lungs healed enough to get them off the vent—that was really a joyous moment."

Staff also successfully cross-trained and built new care teams. "Like most places, we had to draw physicians and nurses from multiple areas—people who'd never worked together before. It's gratifying and inspiring to see a real esprit de corps," says Goodwin. "The MUSC vaccine rollout is another notable success. It's going exceedingly well here. Logistical planning by **Dr. Danielle Scheurer** and her team has been excellent, and the sign-up is easy. People who are supposed to get it are getting it."

This experience will also produce future benefits. "MUSC is planning to expand our critical care footprint by keeping open some areas we've been using for critical care treatment after the pandemic. Expanding critical care access benefits the entire state," says Goodwin. "We also hope to harness the cross-unit teamwork to our advantage. Everyone did a lot of work to create a really good playbook for future crisis responses, and we'll be more forward thinking as we update or build new care areas. We certainly won't have to start with blue prints to separate air flow again."



COVID-19 CLINICAL TRIALS

When the COVID-19 pandemic arrived in South Carolina in March, it became evident to the MUSC research community that there was a need to change the future using clinical research and trials. These trials needed to be coordinated, aligned, and expeditiously moved through our systems to the bedside.

The Division of Pulmonary and Critical Care—together with the South Carolina Clinical & Translational Research (SCTR) Institute—is meeting the challenge of COVID-19 through research aimed at discovering vaccines, new treatments, and ways to prevent or reduce the spread of the virus.

Pulmonary Clinical Trials During COVID-19 Uncover New Challenges and New Opportunities

Testing potential new tests and therapies for COVID-19 in clinical trials ensures that only those that are effective and safe make it to the clinic.

The SCTR—a statewide NIH-funded Clinical and Translational Science Award (CTSA) Program Hub based at MUSC—is playing a central role in fast-tracking clinical trials on the Charleston campus. As one of more than 60 CTSA hubs nationwide, SCTR has been working for over a decade to streamline clinical trials so that patients can benefit sooner from research breakthroughs.

COVID-19 Biorepository Enables Researchers to Study Response to Disease

Patrick Flume, M.D., pulmonologist and co-principal investigator of the South Carolina Clinical & Translational Research (SCTR) Institute, is leading a project to systematically build up a biorepository of COVID-19 samples for research. The biorepository, housed in the SCTR-funded Research Nexus laboratory, is a collection of patient blood and saliva samples that researchers across the state and nation can study to learn more about the virus and gain insights into the body's immune response. Since it opened in April, the biorepository has enrolled 144 unique patients, collected 6,586 aliquoted – or portioned – samples and supported 12 investigator-led research projects, including two at Clemson.



Patrick Flume, M.D., and Pulmonary & Critical Care Clinical Research team above.

A Statewide Collaboration among South Carolina's Research Universities and Largest Health Systems

The widespread availability of coronavirus antibody testing was a key component of a strategy to safely reopen the state. MUSC worked alongside Clemson University and the University of South Carolina, as well as Prisma Health, to develop reliable antibody tests. Antibody testing, along with diagnostic testing, have together provided policymakers with valuable information about the present state of infections so they can determine what, if any, real-time measures might be necessary.

Promising Treatment for COVID-19 Required Quick Thinking to Distribute to those in Need

As COVID-19 cases surged in South Carolina and other hot spots around the country last July, demand continued to grow for remdesivir, one of the only medications that has shown benefit in patients with severe disease. Manufacturer Gilead Science announced that the drug also reduced the risk of death in critically ill patients by 62%. Unfortunately, supplies were limited.

Dee Ford, M.D., professor and interim director, Division of Pulmonary, Critical Care, Allergy and Sleep Medicine, was a key contributor to the plan to ensure its initial allotment of 74 treatment courses would go to those patients who would benefit most. One of the first decisions was to offer five-day, instead of ten-day, treatment courses, doubling the number of patients who could be helped. A recent study showing similar benefit from five- and ten-day courses of remdesivir confirmed the wisdom of that decision.

MUSC Expands Clinical Trials to Regional Hospitals

In June, with the support of SCTR's Research Nexus Laboratory, MUSC Health expanded its COVID-19 clinical trials to its regional hospitals, some of which were among the hardest hit

by this pandemic. The Pulmonary and Critical Care Clinical Research program, led by SCTR co-principal investigator Patrick Flume, M.D., has been charged with running many of these clinical trials.

“Our team is staffing these trials seven days a week to make this happen,” said Ashley Warden, clinical research manager for the MUSC Pulmonary and Critical Care Clinical Research program. “We are helping regional sites to enroll patients into the trials while also providing support to the physicians in Charleston, both pulmonologists and specialists in other fields, who are running the trials here.”

Within weeks, MUSC Health Florence Medical Center began enrolling its first patients into the convalescent plasma study. Soon after, patients from Marion and Lancaster also began receiving plasma. By August, when the U.S. Food and Drug Administration issued emergency authorization for convalescent plasma and the trial was closed, more than 346 patients from the MUSC Health system had been enrolled.

Expanding clinical research to the regional hospitals and to rural areas is one of the goals of SCTR, which was just awarded a five-year grant renewal to continue its work. To meet that goal, it had already been working to build the infrastructure to conduct trials remotely. Those efforts ramped up during the COVID-19 lockdown, when many traditional trials adapted to a virtual format. “When COVID hit, that was just an accelerant for our efforts,” said Flume.

SCTR is continuing to review and open new COVID-19 trials in Charleston and at the regional hospitals. It carefully vets potential trials, notes Flume, to choose those that show the most promise and are the best fit for the needs and the resources of the area.

COVID Vaccine Trial

In August, MUSC joined in the race to find a COVID-19 vaccine. Along with AstraZeneca and IQVIA, MUSC was selected to be part of a Phase III trial of a vaccine that has shown promise in battling COVID-19.

MUSC and Charleston were part of the first wave of locations across the United States to test the vaccine. In total, manufacturers and researchers hope to enroll and collect data on 30,000 people across 20 cities in the U.S., with as many as 1,500 of those being from right here in Charleston. The study being conducted by **Patrick Flume, M.D., and the Pulmonary and Critical Care Clinical Research team**, is designed to last for two years. Flume said they had more than 3,000 people sign up to participate in the trial, which got underway in September. MUSC was able to enroll 126 people during the first week, but then there was a bump in the road. After a brief pause in enrollment, the U.S. Food and Drug Administration gave AstraZeneca the green light to resume testing of the vaccine at sites around the U.S., including MUSC, in October.

A [website](#) has been created to provide information on all active COVID-19 trials.

TELEHEALTH COVID-19 RAPID RESPONSE

Hailed for its ability to erase distance between health care providers in cities and patients in rural areas, telehealth has ironically enabled medical care to continue in a time when we all must keep our distance.

Across the country, telehealth use has spiked as providers offer virtual patient visits to ensure medical needs are met while minimizing COVID-19 exposure. Regulatory agencies have loosened some restrictions on telehealth during this crisis, and more and more payers have begun to reimburse for it as they would for any other medical service.

The Medical University of South Carolina, one of only two Telehealth Centers of Excellence nationwide, quickly mounted a four-pronged response to the COVID-19 pandemic that ensured both continuity of care for patients with suspected or confirmed COVID-19 and continued ambulatory, also referred to as outpatient, care for all other patients. The team of telehealth and bioinformatics experts who led the effort documented their approach and its success in a recent article in the Journal of the American Medical Informatics Association.

Early on, MUSC Health and telehealth leaders saw the need for a coordinated response to the pandemic.

“The same realization was coming to the forefront of the minds of the leadership in telehealth, myself included, that this was going to be a big problem,” said Dee Ford, M.D., director of the MUSC Telehealth Center of Excellence and lead author on the article. “We needed in our own way to create some kind of response to what we believed to be a pretty significant public health problem. Planning started before we even had a case in the state.”

Very quickly, MUSC Health was able to stand up virtual screening of patients with suspected COVID-19 and mobile testing sites across the state, a remote home-monitoring program for patients with less severe COVID-19 and a telesitter program for hospitalized patients that enabled providers to monitor and communicate with patients via an audiovisual monitor, minimizing their exposure and preserving personal protective equipment.

LUNG TRANSPLANT MILESTONES AT MUSC

Louis Besse recently became the 100th lung transplant patient at MUSC Health, which relaunched the program in 2011. Medical Director **Timothy Whelan, M.D.**, called the milestone a great reason to celebrate. “It’s 100 second chances. That’s a big accomplishment.”

When Besse developed a bad cough several years ago, neither he nor his doctor connected it to his work as a chicken inspector for the U.S. Department of Agriculture in Batesburg, South Carolina, west of Columbia. As he saw expert after expert, he got worse and worse. “I’d say five, six years ago, I wasn’t getting enough oxygen to talk and walk at the same time.”

A doctor referred Besse to Whelan at MUSC Health, which has the state’s only transplant center and nationally recognized pulmonary fibrosis center. Whelan diagnosed Besse with chronic hypersensitivity pneumonitis. “It’s also known as bird fancier’s disease. Just a daily exposure to the chicken dust,” Besse said.

Now that he had his answer about what had made him so sick, Besse began to think about getting a lung transplant. He’d have to drop from 250 pounds to just over 200 to improve his odds of success.

“And that’s not the only thing I had to sacrifice. I had to give



Double lung transplant recipient Louis Besse of Batesburg, South Carolina, gets a breathing treatment as he recovers from surgery. Photos by Emma Vought

up my beer,” Besse said.

He knew his chance of getting a transplant through MUSC Health was good. Whelan told him about the program’s track record. “When we look at the data, at MUSC, if you’re on the list for one year, you have a 97%-plus chance you will get your lung transplant. If you’re at other programs, it’s as low as a 50% chance,” Whelan said.

And the medical director said the program’s success rate is strong, too. “If you look at the cohort of 100, it’s an 86% one-year survival rate, which is right in there with the national average. For programs with low transplant rates within one year, you may never get the chance. MUSC is committed to giving its patients that second chance.”

Adapted from original article by Helen Adams.

FELLOWSHIP PROGRAM NOTES



The **PCCM Fellowship Program** is a rigorous 36-month ACGME-accredited combined fellowship in pulmonary and critical care medicine directed by **Edward Kilb, M.D.**, (pictured left) and **Andrew Goodwin, M.D.**, associate program director. We recruit five new fellows per

academic year for a total of 15 fellows. Fellows rotate through three teaching hospitals (MUSC University Hospital, MUSC Ashley River Tower, and the Ralph H. Johnson Veteran’s Affairs Medical Center) during their three years of training. This provides a unique and

unparalleled experience of training in three different hospital systems with varying patient populations and needs.

The fellows are expected to also engage in Quality Improvement Projects and basic science or clinical research, both of which are requirements for graduation. Our training program also includes a 1-year subspecialty fellowship track in **Sleep Medicine** (1 fellow per year) and a 2-year **Critical Care Medicine** fellowship track to prepare the trainee for board eligibility in critical care medicine (2 fellows per year). Additionally, we offer an NIH-funded T32 research training program.

PULMONARY & CRITICAL CARE FACULTY



Jaqueline Angles, D.O.
Assistant Professor
Subspecialty: Adult and Pediatric
Sleep Medicine, CPAP



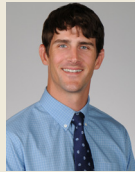
J. Terrill Huggins, M.D.
Professor
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Medicine, Interstitial Lung Disease



Nicholas J. Pastis Jr., M.D.
Professor
Subspecialty: Critical Care
Medicine, Lung Cancer



Rahul Argula, M.B.B.S, MPH
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Medicine, Pulmonary Hypertension



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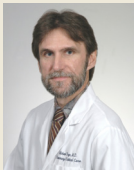
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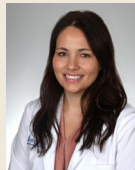
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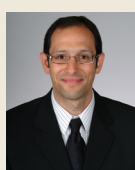
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THE MUSC DEPARTMENT OF MEDICINE

Founded in 1824 in Charleston, The Medical University of South Carolina is the oldest medical school in the South. Today, MUSC continues the tradition of excellence in education, research, and patient care. MUSC educates and trains more than 3,000 students and residents, and has nearly 14,000 employees, including approximately 1,500 faculty members.

As the largest Department in the MUSC College of Medicine, the Department of Medicine provides essential leadership to numerous programs across the university, MUSC Health, and South Carolina. Our Department—made up of 10 divisions engaged in care at two hospital systems and multiple ambulatory practices—is guided by our vision to provide superior patient care, to educate the next generation of physicians, and to perform seminal discovery research.

Changing What's Possible