FORWARD MOMENTUM

2016 YEAR IN REVIEW

MUSC Health
Medical University of South Carolina

Changing What's Possible

About MUSC Health

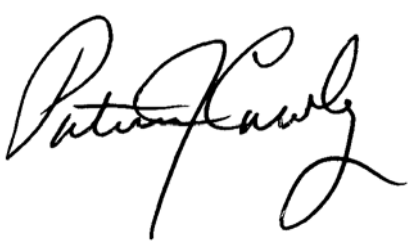
MUSC Health, the clinical enterprise of the Medical University of South Carolina (MUSC), is dedicated to the pursuit of changing what's possible in health care. Nationally recognized for its innovation, patient- and family-centered care, and quality outcomes, this integrated health care system is accessible at the downtown Charleston campus and through more than 100 outreach locations, clinical affiliations with numerous health care partners, and a robust telehealth network. MUSC Health logs more than one million patient encounters annually, and its specialized care teams consistently rank among the best in the country. MUSC Health delivers transformational care shaped by world-class clinicians, health scientists, and educators who provide leading-edge care, while developing the next generation of innovative health care leaders.

The rapid transformation of the U.S. health care system has built a momentum that does not allow for return to the status quo. MUSC Health has likewise transformed itself, integrating its medical center, physician practice, and primary care clinics to ensure that it can provide coordinated, cost-effective care and thrive in this new health care environment. Confident in its ability to provide value-based care, MUSC Health applied to become an accountable care organization in 2016. As of January 2017, it will manage the health of 14,000 Medicare patients.

Thanks to clinical integration, MUSC Health can more easily partner with others in the state to deliver high-quality, patient-centered care. One particularly notable example is the Lowcountry Stroke Collaborative formed with Roper St. Francis, which is a rare example of two competing hospitals joining forces to improve acute stroke care.

In 2016, MUSC Health was again ranked by *U.S. News & World Report* as the number one hospital in South Carolina. Eleven of our programs were nationally ranked—six pediatric and five adult. Only 32 of the 6,239 hospitals in the American Hospital Association's Annual Survey have 11 or more adult and/or pediatric specialties ranked, placing MUSC among the top 1% of all similar American hospitals.

To continue to build its forward momentum, MUSC Health seeks to engage patients of all backgrounds in their own care and in improving the care of others; to encourage continual innovation by its physicians and research scientists so as to develop tomorrow's breakthrough therapies; to share these innovations so that patients throughout the state, nation, and indeed across the globe can benefit; and to educate the next generation of health care providers, giving them the tools and instilling in them the vision they will need to lead medicine forward.



Patrick J. Cawley, M.D., MHM, FACHE
CEO, MUSC Health
Vice President for Health Affairs
Medical University of South Carolina

Contents

Cover: Pediatric cardiac team member Ginger Hudson, R.N.

Left: Aerial photograph of the Medical University of South Carolina campus

MUSC Health's Integrated Centers of Clinical Excellence

MUSC Health is a physician-led integrated health system that transforms expertise, learning, and discovery into unrivaled patient- and family-centered care. To succeed in the dynamic environment shaped by health care reform and to provide quality clinical services across the care continuum, MUSC Health is evolving to demonstrate greater integration. In 2016, it achieved operational integration of its medical center, physician practice, departmental off-campus clinics, and primary care clinics. Such integration facilitates continuous performance improvement, partnership with other health care institutions and providers, and sufficient breadth and depth to manage the health of our patients across the continuum of care.

The Integrated Centers of Clinical Excellence (ICCE) are the organizational units of MUSC Health. Committed to care models that improve patient experience and achieve optimal patient outcomes, these comprehensive care teams are led by physician chiefs who demonstrate both business and clinical expertise and are charged with providing patients the most innovative, efficient, and effective subspecialized care. The ICCE chiefs are directly involved in all aspects of the day-to-day management of the ICCE and are responsible for developing the strategic vision, overseeing the clinical activities and performance to ensure quality care, and driving program growth and patient access.

ICCE have been categorized as either collaborative or patient-focused. The chiefs of the collaborative ICCE are pictured below and the chiefs of the patient-focused ICCE are pictured at right.

Collaborative Integrated Centers of Clinical Excellence

Laboratory/Pathology
Steven L. Carroll, M.D., Ph.D.

Anesthesia
Carlee A. Clark, M.D.

Radiology
Philip Costello, M.D.

Mental Health
Jeffrey S. Cluver, M.D.

Pharmacy
David M. Habib, M.D., Ph.D.

Patient-Focused Integrated Centers of Clinical Excellence

Acute, Critical, and Trauma
Alice M. Boylan, M.D.

Children's Health / Women's
Mark A. Scheurer, M.D.

Digestive Disease, Endocrine and Metabolism
Brenda J. Hoffman, M.D.

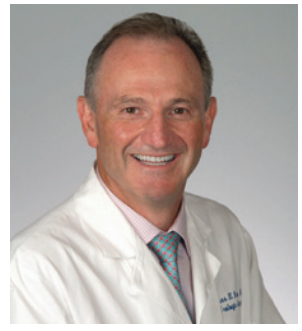
Heart and Vascular
Thomas G. DiSalvo, M.D.

Musculoskeletal
Vincent D. Pelligrini, M.D.

Neurosciences
Raymond D. Turner, M.D.

Oncology
David M. Mahvi, M.D.

Primary Care
David S. Louder, M.D.



Specialty Surgery
Thomas E. Keane, M.D.

Transplant
Prabhakar K. Baliga, M.D.

Dr. Christine Holmstedt, co-director of MUSC Health's Comprehensive Stroke and Cerebrovascular Center, examines a patient.

An Innovative Collaboration to Improve Stroke Care

Putting rivalry aside, MUSC Health and Roper St. Francis, competing hospitals located just across the street from one another, joined efforts to improve stroke care for patients in coastal South Carolina by forming the Lowcountry Stroke Collaborative. The hospitals will pool resources to use telestroke and other innovative approaches to reduce barriers to stroke care and improve its quality. Employing MUSC Health's telestroke carts, Roper physicians and nurses can quickly access a stroke neurologist, who can advise whether a stroke patient is a candidate for the clot-busting drug tPA, which must be administered in a tight time window. Roper physicians will handle the telestroke calls during the day for their locations, but clinicians at both hospitals will share calls at night to ensure 24-hour care at all sites.

Raymond D. Turner, M.D., a neurosurgeon and co-director of MUSC Health's Comprehensive Stroke and Cerebrovascular Center, said the second part of the plan is to eliminate transfers of stroke patients who need specialized surgical care between the two hospitals. According to an agreement reached in late 2016, MUSC Health physicians will travel to other hospitals to take care of the stroke patients there, eliminating 20 to 30 minutes that would have been required for transfer.

"We fight every day to save five minutes here and ten minutes there in patients getting access to tPA and stroke comprehensive services," he said. Eliminating delays in treatment access gives patients a better chance of survival with the fewest limiting disabilities.

Since launching its telestroke program in May 2008, MUSC Health, a comprehensive stroke center, has performed more than 9,000 telestroke consults. "Telestroke has increased access to emergent stroke care to over 96 percent of the state," said Christine A. Holmstedt, D.O., co-director of MUSC Health's Comprehensive Stroke and Cerebrovascular Center. With the addition of the Roper hospitals, the telestroke network has grown to include 26 hospitals and nine primary stroke sites.

Partnering with Patients and Their Families to Improve Care

If you want insight on how to improve care, ask a mother.

Ask Kelly Loyd. Nine years ago, she delivered her twin daughters almost three months early. For the next 77 days, her life revolved around the neonatal intensive care unit (NICU) at MUSC Children's Hospital. "My daughters would not be here without the staff at MUSC and in the NICU," Loyd said. Today her daughters are thriving nine-year-olds.

Ask Caroline DeLongchamps. In 2005, her 11-month-old son was rushed to MUSC with a traumatic brain injury after being hit by a car. He was not expected to live. Due to excellent trauma care, he is a now a healthy sixth-grader.

> "The magic happens with partnership. Collaboration between care team members and patients and families enables us to identify what is best for everyone."—Caroline DeLongchamps

Gratitude led both Loyd and DeLongchamps to volunteer many hours at MUSC, serving on the patient family advisory council (PFAC) and becoming champions of patient- and family-centered care (PFCC).

Loyd, still a volunteer, chairs the PFAC for MUSC Children's Hospital. She has also stepped up to recruit more than two dozen patients and family members to serve on the design teams for the new MUSC Shawn Jenkins Children's Hospital and Pearl Tourville Women's Pavilion, which had its groundbreaking in the summer of 2016 and is scheduled to open in 2019. The input from patients and families ensures that the new hospital will be a welcoming and healing space.

DeLongchamps now serves as the manager of the recently established PFCC department and is charged with recruiting and orienting patients and family members for MUSC Health's six existing PFACs (three adult, three pediatric) and with working with physician and administrative leaders to create more. In 2016, a PFAC for pediatric ambulatory care was created, and a youth advisory council in the MUSC Children's Hospital held its inaugural meeting. Other 2016 achievements include the addition of PFCC training to the nurse residency program and the general orientation for new staff. An advisor manual was created for patients joining a PFAC, and, most importantly, the department is building relationships with campus leaders committed to promoting partnerships with patients and families.

Viewing care through the eyes of patients and their families leads to changes that make care more comfortable, convenient, and compassionate. It can also improve outcomes and make hospitals safer. That is why DeLongchamps reports to Chief Quality Officer Danielle B. Scheurer, M.D., MSCR.

For example, patient and family advisors now attend MUSC Health's infection prevention and control committee and have been asked by David G. Bundy, M.D., MPH, vice chair for quality and safety at MUSC Children's Health, to regularly attend safety rounds.

"MUSC recognizes the value of family participation to the point that it will bring families into talking about some of our most difficult subjects—and that is quality and safety—because it wants to have their input and get their feedback," said Loyd.

Not resting on its laurels, the PFCC department has ambitious plans for 2017 and beyond. In June, it invited representatives of a nonprofit organization dedicated to PFCC to campus to evaluate MUSC Health. After meeting with more than 100 care team members, patients, and family members and reviewing the strategic plan and other core documents of MUSC Health, they made 20 recommendations. Most of those

A meeting of a pediatric patient family advisory council

recommendations have become initiatives led by members of the recently created PFCC steering committee. Sample initiatives include supporting clinicians in the adoption of open notes (i.e., sharing clinical notes with patients) and a change in the concept of family as visitors.

"Right now, everyone gets a badge that says he or she is a visitor. We would like a more robust process for that," said DeLongchamps. "Family should not be labeled as visitors because visiting hours should not apply to them. I would prefer not to be labeled as a visitor if I am Mom."

Twenty initiatives might sound daunting, but don't underestimate what these committed moms and family members can accomplish when they are welcomed to participate in decisions that affect the most vital aspects of care. "The PFCC department is not saying patients have all the right answers," said DeLongchamps. "The magic happens with partnership. Collaboration between care team members and patients and families enables us to identify what is best for everyone." To learn more, visit MUSChealth.org/quality/patient-and-family.

Thinking Outside the Exam Room

Dr. David Louder, chief of the MUSC Health Alliance

This year will be a watershed year for health care reform, as physicians begin to report on performance measures and make the transition from fee-for-service to value-based care.

MUSC Health took several critical steps in 2016 to ensure that it would be a leader in the new health care environment, in which health care institutions are asked to assume responsibility for improving the health of local populations.

First, it reached agreements in October 2016 to become an in-network provider for the Blue Cross Blue Shield plans offered on the federally facilitated health care exchange and for Blue Choice Medicaid, one of the six Medicaid plans provided by the South Carolina Department of Health and Human Services. With the signing of these new agreements, patients covered under these plans can now benefit from the specialty and subspecialty care available at MUSC Health and MUSC Children's Health.

Second, it established the MUSC Health Alliance, a clinically integrated network (CIN), and recruited David S. Louder, M.D., MBA, to be its chief. Louder had previously established a CIN at Carroll Hospital in Westminster, MD.

"CINs are designed to improve the health of populations, improve the care we give patients, and lower costs," said Louder. "By integrating the hospital, the faculty practice plan, and MUSC Physicians Primary Care—the three MUSC Health entities that provide patient

care—into the MUSC Health Alliance, we will be able to work together better to provide quality, cost-effective care to our patients."

Third, the MUSC Health Alliance applied to Medicare to become an accountable care organization (ACO), effective January 1, 2017. ACOs are asked by Medicare to manage the health of an identified population. They share in the savings if they are successful in controlling costs while providing high-quality care but also assume the risk of having to reimburse Medicare if quality and cost parameters are not met. As an ACO, the MUSC Health Alliance will be responsible for working to optimize the health of about 14,000 patients, whose names will be provided by Medicare.

"We think we can deliver better care, sustain revenues, and lower the cost that Medicare sees," said Louder. "Medicare wants to pay for value, not just volume. By applying to be an ACO, we have said we are game to help with that. We have the analytics, IT, and clinical tools needed to provide value-based care."

Using special algorithms, the MUSC Health Alliance analytics team can predict which of the identified patients will be the most expensive in the following year. Those patients can then be flagged for interventions that address the root causes of poor outcomes.

"This involves care happening outside of where we think of care happening—it happens at home," said Louder. "Does someone need to check that the pillbox is being filled correctly? Does a patient miss appointments because he has no transportation? We have to think outside the exam room."

Taking the time to understand the needs of patients and putting them in touch with social service agencies and volunteer and faith-based organizations can go a long way to engaging them in their own health care and improving adherence.

> "Medicare wants to pay for value, not just volume. By applying to be an ACO, we have said we are game to help with that."—Dr. David Louder

With their ability to closely coordinate primary, specialty, and emergency care, CINs and ACOs also encourage innovative approaches to improving population health. For example, hospital readmissions for some patients with chronic diseases such as heart failure, chronic obstructive pulmonary disease, and diabetes could perhaps be avoided if the patients were actively managed in the emergency department and then released, with a follow-up appointment with their specialist arranged for the next morning.

But Louder thinks we can go further. "If we provide evidence-based outpatient care to those patients and keep them healthier, maybe they don't tip over and come to the emergency room in the first place," said Louder.

Although Louder is a firm believer that such new approaches can cut costs while maintaining or improving the quality of care, he understands that the reporting requirements that will be required for reimbursement can seem overwhelming to already time-strapped physicians.

For him, a major aim of a CIN such as the MUSC Health Alliance is to help shoulder that burden and to improve the clinician experience. As the Alliance matures, it can offer these benefits to community practices that elect to join.

"MUSC Health really wants to be a leader in the successful transformation of health care, and that requires the cooperation of everyone from the folks seeing the patients to the administrative folks and physician leaders who are trying to respond to changes in health care," said Louder. "But we can be very successful for our patients if we are all working together."

Improving Communication Between Providers and Limited English-Proficient Patients

Medical interpretation is coming of age. Standards of practice were developed in 2005 and national certification became available in 2009. Joining in nationwide efforts to professionalize this discipline and improve provider communication with diverse patients, MUSC Health is revamping its model of care for limited English-proficient (LEP) patients.

In 2016, MUSC Health medical interpretation care team members underwent a 40-hour training program. This training helped to enhance their skills and provided baseline preparation for national certification. All MUSC Health medical interpreters are expected to gain national certification by December 2018. Four spoken language Spanish interpreters and three American Sign Language interpreters have already been nationally certified.

MUSC Health also offered training in medical interpretation to the community in 2016, and in January 2017 will serve for the first time as a testing site for national certification for both spoken language and American Sign Language medical interpreters.

"We have an exceptional team of medical interpreters," said Stephanie Taylor, MPS, director of diversity and inclusion, who joined MUSC Health in January 2016. "They are actively engaged, they love their jobs, and all have a commitment to be at the top of their profession."

Clinicians often depend on a patient's family members to interpret when professional medical interpretation is unavailable. But family members can misinterpret information, may not be familiar with medical terminology, or even worse may leave out crucial diagnostic information and treatment instructions. "The presence of a trained medical interpreter ensures effective patient-provider communication," said Taylor. "It also encourages patients to be more engaged and involved with their care."

> "The presence of a trained medical interpreter ensures effective patient-provider communication."—Stephanie Taylor

Spanish is the most common language spoken by MUSC Health's LEP patients, and in-person medical interpreters are available to Hispanic patients 24 hours a day, year round. In addition to in-person medical interpretation for in-patients and on-campus locations, MUSC Health also offers telephonic interpretation for all patients, including those being seen at off-campus clinics and physicians' offices. Telephonic interpretation is available in more than 250 languages.

Every effort has been made to integrate medical interpreters into the care team. In the summer of 2016, interpreters began to wear green jackets so that they could be more easily recognized by care team members, patients, and families. They also began to document interpretation in the electronic health record. These efforts demonstrate MUSC Health's commitment to enhancing patient care experiences, delivering high-quality care, and reinforcing the importance of "team" in the delivery of care to all patients.

Although Taylor and the medical interpretation care team members are meeting the current needs for medical interpretation, they are exploring how to expand in-person services to address the growing population of patients with language needs.

"One strategy is to identify bilingual care team members with clinical responsibilities," Taylor said. "We would have their oral language skills assessed by an outside organization. If they

Stephen Lee Morris, Jr., a medical interpreter (right), facilitates communication between resident physician Dr. Anne Wanaselja (center) and a patient (left).

are able to pass the oral assessment, we would have them trained to serve as medical interpreters." Once trained, these bilingual care team members would be immediately accessible to patients in their unit. Patients would no longer have to await the arrival of an interpreter.

"Interpreting is not just about being the mouthpiece of the patient or the clinician," said Taylor. "It's also important for the interpreter to understand the patient's culture."

In order to foster greater respect and understanding in the delivery of culturally competent care, the medical interpretation team produces "The Cultural Spotlight," an online newsletter that introduces different cultures and communication strategies to providers.

According to Taylor, the interpreter's skill can enhance the quality of care and improve both patients' perceptions of care and overall experience.

Anton J. Gunn, MSW, chief diversity officer at MUSC Health, could not agree more. "Effective medical interpretation is not only critical to delivering safe and quality care, it also offers a more inclusive experience for our patients," said Gunn. "This improves patient engagement and satisfaction. I am so proud of how our interpretation care team members are adding value to the lives we touch."

The Zucker Institute for Applied Neurosciences makes 3D-printed, patient-specific anatomical models that MUSC Health surgeons can use to plan surgery and educate patients.

The Zucker Institute for Applied Neurosciences

In 2016, the Zucker Institute for Applied Neurosciences (ZIAN) saw FDA approval of its first licensed medical device, Sinu-Lok™ (Amendia, Marietta, GA), a rod implant used in minimally invasive spinal fusion surgery. By overlaying a sine wave (oscillating) shape on the standard bowed fixation rod, Sinu-Lok provides more optimal spinal implant positioning.

Sinu-Lok is an improvement over the standard rods surgeons have used in lumbar spinal fusion surgery. The standard rod puts stress on the construct components, which can lead to a loosening of the construct after surgery and other complications. Sinu-Lok's sine wave shape creates several concave locations in which the screws can seat when tightened. This patented shape also provides an extended range of axial connections between the screw-rod interface when the construct is tightened, creating divergence of the screw towers instead of the convergence caused by the standard rod.

The news in 2016 was also good for a second ZIAN device, the Blink Reflexometer™. The device uses stimuli and a high-speed camera to detect changes in an individual's blink reflex after mild traumatic brain injury (concussion). A pilot study showed that the Blink Reflexometer™ successfully detected significant changes in blinks after concussion. The data are expected to be published in 2017, and the device is expected to be commercially available by 2018.

Surgeons at MUSC Health are now using 3D-printed, patient-specific anatomical models, including skulls, for surgical planning and patient education, thanks to ZIAN, which created 14 of these models in 2016. This is in keeping with the technology accelerator's missions of affecting patient outcomes and fast-tracking the development of neuroscience technologies into the clinic.

A Pioneering New Technique for Mechanical Thrombectomy

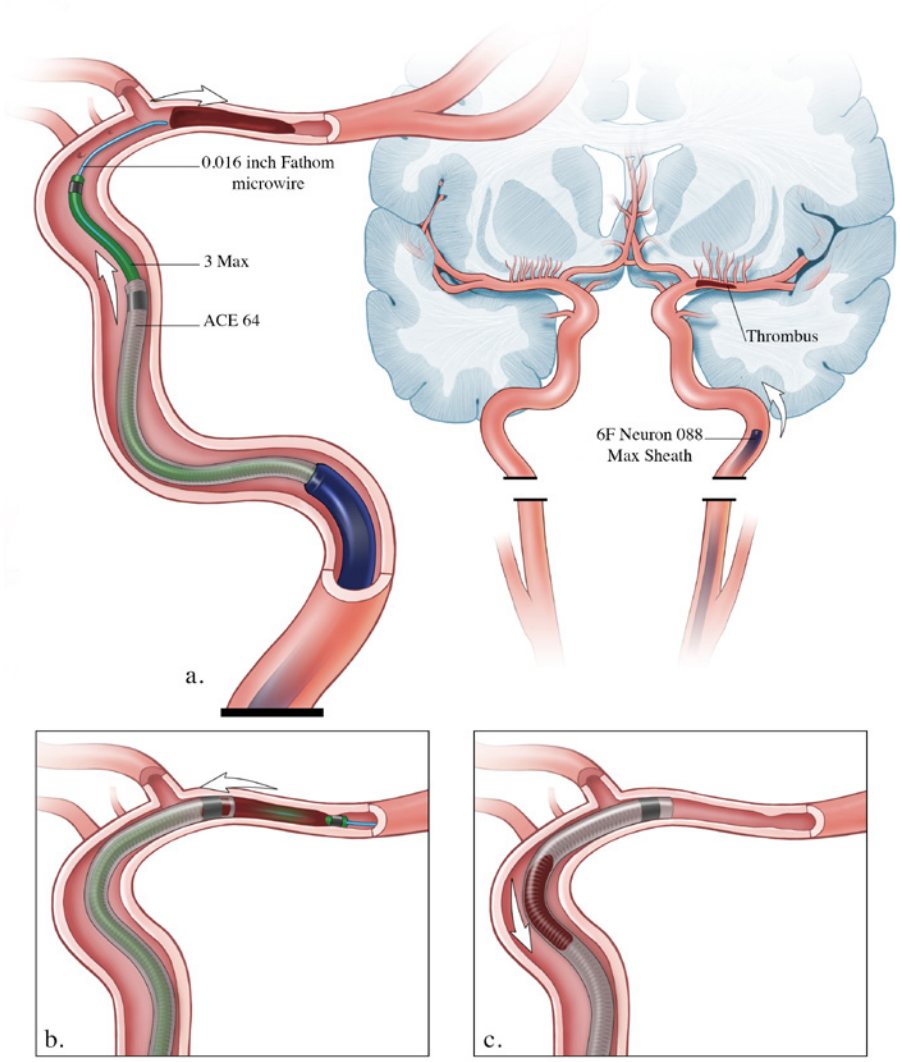


Illustration by Emma Vought

a) Neuron Max is placed in the distal cervical internal carotid artery. The ACE 68 catheter is advanced over the 3 Max catheter telescoped with a Fathom 16 wire to the clot occluding the middle cerebral artery (MCA).
b) The ACE 68 catheter is advanced to the face of the clot in the MCA and the 3 MAX and wire are removed.
c) The clot is ingested through the ACE 68 catheter under aspiration.

In 2015, five landmark clinical trials provided the evidence that mechanical thrombectomy using stent retrievers was safe and effective for certain patients with acute ischemic stroke. On the basis of that evidence, the American Heart Association (AHA) revised its guidelines for acute stroke to recommend that stent retrieval devices be used to remove blood clots in large arteries for patients with acute ischemic stroke. As that news has traveled worldwide, the volume of endovascular surgery for stroke has increased dramatically. The AHA noted that other mechanical thrombectomy techniques may be used at the discretion of the physician.

One of the most popular of these is the direct aspiration, first-pass technique (ADAPT), developed by MUSC Health neuroendovascular surgeons M. Imran Chaudry, M.D., Alejandro M. Spiotta, M.D., Aquilla S. Turk, D.O., and Raymond D. Turner, M.D. ADAPT aims to remove a large-vessel clot in its entirety with a large-diameter aspiration catheter. This large catheter is inserted via the femoral artery and advanced to the site of the clot, where suction is applied to remove it and restore blood flow to the brain. If the first-pass attempt is unsuccessful, stent retrievers can then be used. The team reported their initial findings in a seminal 2014 article in the *Journal of Neurointerventional Surgery* (doi: 10.1136/neurintsurg-2013-010713) and in 2016 reported longer-term results from

a single center (MUSC Health) in an article published online ahead of print on April 18, 2016 in the same journal (doi:10.1136/neurintsurg-2015-012211). In the 2016 article, the MUSC Health team reported the results of a retrospective analysis, showing that blood vessels were successfully reopened in 180 (94.2%) of 191 consecutive patients with acute ischemic stroke who underwent thrombectomy using ADAPT at MUSC Health.

Turk is one of the national principal investigators for the COMPASS trial (NCT02466893), which is comparing direct aspiration (ADAPT) vs. the use of a stent retriever as the first approach to thrombectomy. The other principal co-investigators are J. Mocco, M.D. of Mount Sinai and Adnan Siddiqui, M.D., Ph.D. of the University at Buffalo. The trial has already enrolled 150 patients and will likely meet its goal enrollment of 270 patients within the next year. The results of this trial, expected by the end of 2017, could reshape the field in terms of best practice for the removal of a blood clot in stroke by showing definitively whether ADAPT or stent retrievers are more safe and effective.

Developing an Individualized Approach to Aphasia Care

More than a third of stroke patients experience aphasia, a disorder that interferes with patients' ability to speak, listen, read, and/or write. In some patients, symptoms resolve, but in others the effects on quality of life are devastating. Currently, physicians cannot reliably predict which patients will recover or which therapies will help them to do so.

A new collaborative initiative by MUSC, the University of South Carolina, Johns Hopkins University, and the University of California Irvine is attempting to change that. They comprise the Center for the Study of Aphasia Recovery, which was launched in 2016 by Julius Fridriksson, Ph.D., of the University of South Carolina with $11.1 million in funding (over five years) from the National Institutes of Health.

The center aims to lay the foundation for individualized aphasia care, in which patients will receive the most appropriate treatment to address their specific stroke signature. Together, the four research sites will be able to recruit hundreds of patients with aphasia for the study. "Once finished, this is going to be the largest study of aphasia recovery in the past couple of decades," said Fridriksson.

A long-time collaborator of Fridriksson, MUSC Health neurologist Leonardo Bonilha, M.D., Ph.D., one of the principal investigators of the MUSC research site, is exploring whether disruptions to white matter connectivity after stroke affect language abilities. White matter fiber tracts are the insulated wires that connect one area of the brain to others. Currently, structural MRI is used after stroke to assess lesions in the cortical tissue—the brain's grey matter. However, the extent of cortical damage often does not correlate with the severity of language deficits.

In the June 22, 2016 *Journal of Neuroscience*, Bonilha and his MUSC and USC collaborators reported findings suggesting that imaging all of the brain's connections (i.e., the connectome) in addition to imaging only the areas of cortical damage can help determine which patients will have language deficits, how severe those deficits will be, and how much potential there will be for recovery. This information could then be used to direct rehabilitative therapy to improve outcomes.

MUSC Health speech pathologist Katie Murphy works with stroke patients.

Stem Cell Therapy for Heart Failure

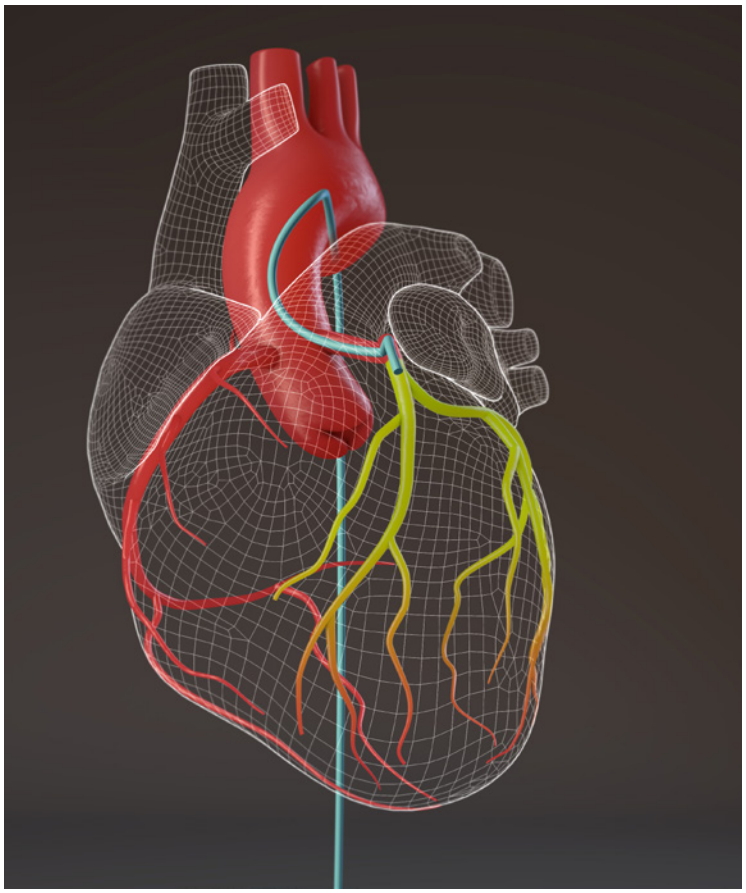
MUSC Health cardiologist Michael R. Zile, M.D., was awarded Department of Defense funding in 2016 for a phase 2 clinical trial of a new stem cell treatment in patients with heart failure with preserved ejection fraction (HFpEF). The three-year grant, totaling $2.7 million, addresses an unmet need in a diverse population.

HFpEF accounts for half of heart failure cases and appears earlier in veterans and nearly twice as often in women than in men. Heart transplant is available to patients with other forms of heart failure but not to HFpEF patients, who have the same severe symptoms and level of disability.

Technology developed by Eduardo Marbán, M.D., Ph.D., of Cedars-Sinai Medical Center, and Capricor Therapeutics, Inc., allows researchers to isolate stem cells from unmatched human donor hearts and expand them into millions of cardiosphere-derived cells (CDCs). Previous preclinical work by Marbán and Zile has shown that CDCs reside transiently within heart muscle, long enough to reprogram cells stressed by HFpEF to function more normally and to trigger improvements in heart function over time. Patients do not need immune rejection medication such as they would after a heart transplant.

HFpEF patients in the study receive an infusion of CDCs directly into their coronary arteries. Their heart function is mapped closely for six months by MUSC Health cardiologists Sheldon E. Litwin, M.D., who directs the cardiac imaging core lab, and Valerian Fernandes, M.D., who directs the cardiac catheterization core lab. Jennifer Van Eyk, Ph.D., of Cedars-Sinai Women's Heart Center is examining novel biomarkers in patient blood that could signify beneficial changes in heart architecture.

Zile and Litwin are also developing drug, device, and weight loss strategies in these patients. This multimodal approach provides patients with hope that they can overcome the crippling disabilities caused by HFpEF.



An artist's rendering of the heart showing the delivery of the cardiosphere-derived cells through the aorta and into the coronary arteries. Illustration by Emma Vought.

MUSC Health Tests 25,000 People for Alpha-1

The Division of Pulmonary, Critical Care and Sleep Medicine is home to the Alpha-1 Foundation Genetic Counseling Program (GCP) and the Alpha-1 Coded Testing (ACT) Study. With support of the Alpha-1 Foundation, these programs help people across the nation access testing, education, and resources for alpha-1 antitrypsin deficiency (Alpha-1), a rare genetic disease.

Home genetic testing is a controversial approach to disease diagnosis. But adults with chronic obstructive pulmonary disease and adults and children with liver disease are able to use a home finger stick test in this free and confidential research program administered by alpha-1 coded testing study coordinator Laura Schwarz. To ensure that participants understand their genetics, they are invited to call the GCP to discuss test results and family genetic testing. Kim Brown, MS, is a certified genetic counselor working with the program.

The national GCP call volume continues to increase and, by the end of the year, more than 5,000 people will have accessed the service. Since 25 percent are health care professionals, MUSC Health is known across the United States as a center for alpha-1. Since 2001, the ACT Study has tested over 25,000 extremely satisfied individuals.

"We help alpha-1 families understand this rare disease," said Charlie B. Strange, M.D., director of the program.

Alpha-1 care by MUSC Health pulmonologists is available to regional callers. More information about these programs can be found at www.alphaoneregistry.org.

A Startup Born of MUSC Collaboration Wins Prestigious Award

ToleRaM Nanotech, LLC, a startup company that specializes in merging bioengineering with medicine, was the recipient of a National Tech-Connect Innovation Award in 2016. The award is given for technology that has the potential to make a difference in a special sector—in this case, medicine. The top 15 percent of submitted technologies win the prestigious award.

The three founders of the company, formed in January 2014, are all from MUSC and include Carl Atkinson, Ph.D., an expert in immunology and the innate immune system; Ann-Marie Broome, Ph.D., a biomedical engineer with expertise in nanotechnology; and Satish N. Nadig, M.D., Ph.D., a transplant surgeon who also has a doctorate in immunology.

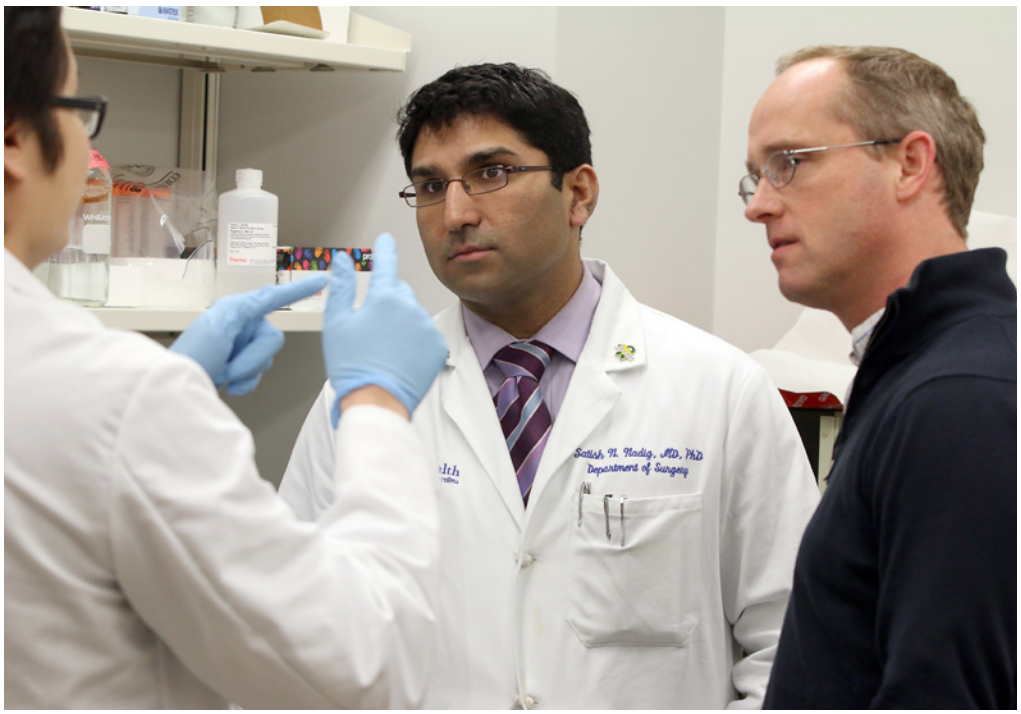
Nadig, the company's chief medical officer, said he wants to see better outcomes for transplant recipients who often succumb to the systemic side effects of standard immunosuppression treatment.

"What ails our transplant patients is that all of them are susceptible to infections, cancers, diabetes and general systemic consequences of their very powerful immunosuppressant medications," said Nadig. "It's a double-edged sword, because they need these medications to keep them from rejecting their organs."

The three MUSC scientists have successfully demonstrated in mouse models a way to deliver the immunosuppressant rapamycin via a nanocarrier to a transplanted kidney and its local environment only, leaving the rest of the body's immune system unaffected. Although rapamycin is a highly effective immunosuppressant that encourages proliferation of suppressive T cells, it is seldom used in the clinic for transplant patients because of its systemic side effects, such as slowing wound healing.

The team's rapamycin nanocarrier, referred to as TRaM for targeted rapamycin micelle, allows the drug to be used to help prevent kidney rejection without causing such undesired side effects.

Nadig thinks their research could revolutionize the way doctors deliver medications in transplantation. "It potentially will lower rejection of a transplanted organ while allowing the patient to be able to fight off infection and go about a normal life," said Nadig. "This is exciting to the team, given that 20 percent of people on the transplant list need a re-transplant because they've lost their organ to chronic rejection."



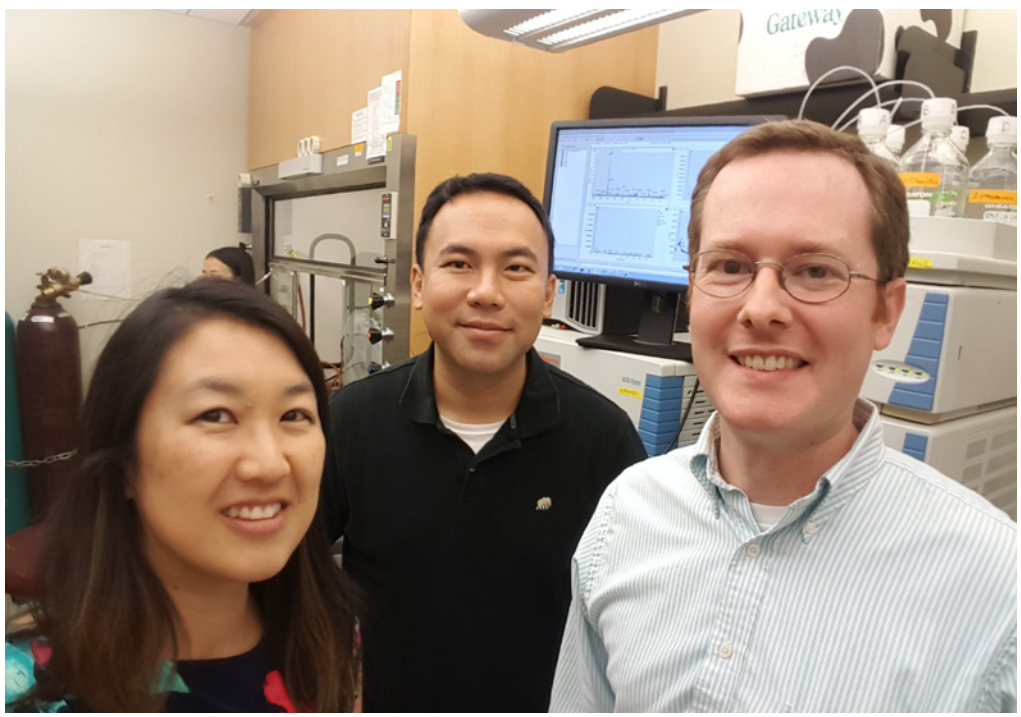
Dr. Satish Nadig (center) and Dr. Carl Atkinson (right), two of the founders of ToleRaM Nanotech

Treating Epilepsy with Vitamin K Analogs

Neuroene Therapeutics, a startup company born from unique research by two MUSC investigators, secured a Small Business Technology Transfer (STTR) grant for $225,000 in July from the National Institute of Neurological Disorders and Stroke (NINDS).

Neuroene Therapeutics is using the phase 1 STTR grant to help further develop a novel class of compounds for treating epilepsy. In the U.S. alone, epilepsy's estimated direct and indirect costs total $15.5 billion, according to the Health and Medicine Division of the National Academies of Sciences.

"This class of compounds has a new molecular mechanism that makes it different from any of the current anti-seizure drugs available to patients with epilepsy," said Neuroene Therapeutics chief operating officer and co-founder Sherine Chan, Ph.D., associate professor of drug discovery and biomedical sciences. "An estimated 30 to 40 percent of epilepsy patients do not have sufficient control of their seizures with current treatments. We intend to provide a new generation of anti-seizure drugs that is clearly needed."



Co-founders Dr. Sherine Chan (left) and Dr. James Chou (center); Chief Scientific Officer Dr. Richard Himes (right)

Launched in May 2015, Neuroene Therapeutics is based on Chan's collaborative research with James C. Chou, Ph.D., associate professor of drug discovery and biomedical sciences. Chou is also a Neuroene Therapeutics co-founder and serves as chief executive officer. Their focus is on vitamin K analogs, not only for epilepsy, but also for other difficult-to-treat neurological disorders. Studies at MUSC and NINDS reveal that these compounds produce fewer side effects than current treatments, as vitamin K is a safe macronutrient essential for health and function of the central nervous system.

The MUSC Foundation for Research Development (FRD), the university's technology transfer office, assisted Chan and Chou in establishing the startup company and also guided them through the STTR application as well as other grant opportunities. The S.C. Research Authority has awarded a separate $50,000 grant to the company.

CuRE Innovations, LLC, a company developing advanced dental materials that were invented at the MUSC College of Dental Medicine, was also awarded a phase 1 STTR through FRD's assistance.

Groundbreaking Clinical Trials

Lupus

MUSC Health rheumatologists Gary S. Gilkeson, M.D., and Diane L. Kamen, M.D., MSCR, are leading the first clinical trial in the U.S. to use allogeneic mesenchymal stem cells (MSCs) as an investigative treatment for systemic lupus erythematosus (SLE), a chronic, relapsing, multi-system autoimmune disease. MSCs secrete immunomodulatory factors that preferentially migrate to sites of inflammation, offering a more targeted therapy with fewer adverse effects than immune-suppressing treatments. The MUSC Health researchers are studying the safety and efficacy of using MSCs to treat patients with SLE. The phase 2 MSCs in SLE trial (MsciSLE; NCT02633163) will randomize patients with treatment-refractory lupus to standard of care plus a single IV infusion of low-dose MSCs (one million MSCs per kilogram), high-dose MSCs (five million MSCs per kilogram), or placebo. The trial, opening first at MUSC Health, will later be joined by additional sites—Emory University, the University of North Carolina at Chapel Hill, the University of Rochester, Northwestern University, and Cedars Sinai. The Center for Cellular Therapy at MUSC, which houses a cGMP Class 6–compliant clean room suite, will supply the MSCs, harvested from donated umbilical cords, for infusion at all study sites. For more information, contact study coordinator Angela Robinson at robia@musc.edu or 843-792-6043.

Dr. Diane Kamen (left) and Dr. Gary Gilkeson (right)

Cancer Match Trial

A National Cancer Institute trial, Molecular Analysis for Therapy Choice (NCI-MATCH), seeks to personalize treatment for patients with advanced cancer that has returned or worsened after standard systemic therapy. MUSC Hollings Cancer Center is one of the sites for this study, which is expected to screen 5,000 patients nationwide for more than 60 mutations thought to be implicated in different types of solid tumors and lymphomas. The goal is to find a specific mutation that could be driving a cancer's growth and match it with an investigatory drug that has been shown to halt that type of cancer in participating clinical trials at medical institutions around the country. MUSC Health medical oncologists Antonio Giordano, M.D., Ph.D., and John M. Wrangle, M.D., are the principal co-investigators for the MUSC Health site of the trial and are collaborating with colleagues from various disciplines across campus, including radiologists, interventional radiologists, pathologists, and surgeons. Hollings is participating through its membership in the NCI Community Oncology Research Program. For more information, contact MATCH coordinator Joni Harris at harrisj@musc.edu or 843-792-8876.

Non-Small Cell Lung Cancer

In an international first, a clinical trial will test whether a new two-drug combination can jump-start and accelerate patients' immune response to lung cancer. The trial (NCT02523469), now enrolling patients at MUSC Hollings Cancer Center, focuses on non-small cell lung cancer, the most common type. Medical oncologist John M. Wrangle, M.D., will serve as principal investigator on the three-year project, and Mark P. Rubenstein, Ph.D., has worked with him to design the trial. The phase 1B/2 study will test the effectiveness of using the checkpoint inhibitor nivolumab in combination with the immune stimulation drug ALT-803 in patients with pretreated, advanced, or metastatic cancer. T cells can lose their immunity effectiveness in the tumor microenvironment, but nivolumab can awaken and stimulate them to recognize and kill nearby tumor cells, eliminating tumors in about five percent of patients. The clinical study will test whether ALT-803, a drug developed by Altor Bioscience in collaboration with Rubinstein, could enhance the effectiveness of nivolumab to eliminate tumors. To ask about enrolling, contact Joni Harris at harrisj@musc.edu or 843-792-8876.

Advanced Hepatocellular Carcinoma

Carolyn D. Britten, M.D., director of the Division of Hematology/Oncology, is principal investigator of a phase 2 clinical trial intended to evaluate the efficacy and safety of a sphingosine kinase-2 (SK-2) selective inhibitor (YELIVA™; RedHill Biopharma) in patients with advanced hepatocellular carcinoma (HCC), the most common primary malignant cancer of the liver and a type of cancer with one of the highest mortality rates. YELIVA™ is a proprietary, first-in-class, orally administered SK-2 selective inhibitor with anti-cancer and anti-inflammatory activities. The study aims to enroll patients who have experienced tumor progression following treatment with first-line single-agent sorafenib (Nexavar®). The study is supported by a grant from the National Cancer Institute designed to foster collaboration across clinical and laboratory research for the study of signaling in sphingolipids, a class of lipids known to be involved in the growth of solid tumor cancers. RedHill Biopharma is providing additional support for the trial, which will be conducted at MUSC Hollings Cancer Center. For more information, contact Alan Brisendine at brisend@musc.edu or 843-792-9007.

Robert Williams, MUSC Hollings Cancer Center clinical trial participant.

New Collaborative Center to Improve Minority Men's Health

Minority men in the U.S. are more likely than white men to develop and die from a number of chronic conditions. Compared with white men, African-American men are 30 percent more likely to die from heart disease and 60 percent more likely to die from stroke, and Hispanic men are twice as likely to die from diabetes. Rates of prostate cancer and related deaths in African-American men are among the highest in the world. Despite more than two decades of research focused on understanding health disparities, minority men still face a significant burden from chronic diseases. That may be about to change.

Chanita Hughes-Halbert, Ph.D., professor of Psychiatry and Behavioral Sciences and SmartState™ AT&T Distinguished Endowed Chair in Cancer Equity at the MUSC Hollings Cancer Center, is the principal investigator for an $8 million grant from the National Institute of Minority Health and Health Disparities and the National Cancer Institute to develop the MUSC Transdisciplinary Collaborative Center (TCC) in Precision Medicine and Minority Men's Health.

The grant creates a multi-regional network of academic medical centers, community-based health organizations, public health agencies, and community stakeholders that will collaborate to develop strategies for precision medicine and clinical care to improve health outcomes for minority men.

"The attention that minority men get in the context of research efforts is really very limited," said Hughes-Halbert. "Our approach with the TCC is to address these knowledge gaps using transdisciplinary strategies to integrate genomic, social, behavioral, and clinical data. It's really an innovative approach to improving health outcomes among minority men because we are bringing together diverse disciplines to address a common issue."

New Collaborative Center *(continued)*

The first phase involves researchers from multiple disciplines across MUSC conducting three research projects to improve prostate cancer outcomes in minority men.

The first project, led by Hughes-Halbert and Michael B. Lilly, M.D., professor of developmental cancer therapeutics and associate director of translational research at MUSC Hollings Cancer Center, focuses on a new vaccine for prostate cancer (PROSTVAC®; Bavarian Nordic, Kvistgaard, Denmark) in men at high risk for cancer recurrence.

The second project, led by Richard R. Drake, Ph.D., professor of Cell and Molecular Pharmacology and Experimental Therapeutics, and Jennifer Wu, Ph.D., associate professor of Microbiology and Immunology, aims to develop a more precise method for early detection of prostate cancer based on glycans and immune responses in the tumor microenvironment.

The third project, led by Sebastiano Gattoni-Celli, M.D., professor of Radiation Oncology, examines genomic responses to vitamin D supplementation among men with prostate cancer.

Clinical data from the three research projects will be integrated and interpreted using bioinformatics in the context of social and psychological determinants of disease. The results will be used to identify new approaches for improving prostate cancer outcomes in minority men through precision medicine.

"Precision medicine is an approach to understanding disease by integrating genetic, environmental, and lifestyle data to understand how those variables contribute to disease risk and outcomes," said Hughes-Halbert. "The MUSC TCC is particularly innovative because we're considering how psychological and social factors influence the risk for and response to disease along with clinical interventions."

"Precision medicine is an approach to understanding disease by integrating genetic, environmental, and lifestyle data to understand how those variables contribute to disease risk and outcomes."—Dr. Chanita Hughes-Halbert

The TCC initiative demonstrates the unique capability of the MUSC research enterprise to conduct integrated bioinformatics and genomics research across three separate projects focused on the same issue—addressing health disparities among minority men with prostate cancer.

The implementation core, led by Cathy L. Melvin, Ph.D., M.P.H., associate professor of Public Health Sciences, and Gayenell S. Magwood, Ph.D., R.N., professor in the College of Nursing, will bring together diverse stakeholders, including community members, public health professionals, and clinical practitioners, to identify how precision medicine can address their healthcare priorities.

"This part of the project draws on another unique institutional strength at MUSC, which is the breadth and depth of experience we have with community engagement and implementation and dissemination science," said Hughes-Halbert. "We're able to bring together diverse stakeholders to think about and discuss how to best apply precision medicine to improve the clinical care of minority men."

In addition to the research being conducted on prostate cancer, the MUSC TCC will support research that develops precision medicine strategies for other chronic conditions, such as diabetes and cardiovascular disease, that also disproportionately affect minority men.

Dr. Chanita Hughes-Halbert leads the MUSC Transdisciplinary Collaborative Center in Precision Medicine and Minority Men's Health

If You Smoke, Expect a Call

MUSC Health has raised the alarm on smoking, one of the largest causes of preventable disease. The MUSC Health Tobacco Treatment Program provides evidence-based support to help our patients quit smoking.

Smoking leads to disease and disability in nearly every organ in the body. Smoking and tobacco use cause 480,000 deaths annually in the United States and 7,200 per year in South Carolina, costing the state $1.9 billion in health care expenses each year.

Dr. Katherine Hoover (left) is a pharmacist working with the MUSC Health Tobacco Treatment Program.

Contrary to what some believe, most people who smoke want to quit. The Tobacco Treatment Program capitalizes on this opportunity by working with patients on a quit plan when they visit MUSC Health as an inpatient or as an outpatient. This may represent the first help some patients receive to quit a long-time addiction.

Led by internationally renowned experts in tobacco control and treatment, including K. Michael Cummings, Ph.D., MPH, Graham W. Warren, M.D., Ph.D., Matthew J. Carpenter, Ph.D., and Benjamin A. Toll, Ph.D., the program was launched in 2013 to help patients achieve superior health outcomes and to address Joint Commission requirements. It screens all patients 18 years and older about tobacco use at admission and then refers tobacco users to a dedicated evidence-based tobacco cessation program.

Dedicated tobacco treatment specialists receive daily information on patients who need help quitting and visit patients while they are in the hospital to encourage them to quit, discuss the adverse effects of tobacco, and develop an individualized tobacco treatment plan for them. Patients are then discharged and automatically enrolled in a follow-up program that helps track tobacco use and provide support for patients to continue to receive cessation support either through the state Quitline (1-800-QUITNOW) or the outpatient Tobacco Treatment Program at MUSC Health. Started at the MUSC Hollings Cancer Center, the outpatient Tobacco Treatment Program offers in-person assessments, counseling, and medication support for outpatients at MUSC Health. The program has now expanded to the emergency department with tremendous success, and pilot programs are now being rolled out for primary care clinics.

The early effects of the Tobacco Treatment Program are being realized. In the first two years of the program, 66,290 adults were screened for tobacco use, 11,228 were identified as current smokers, and 2,566 received bedside counseling by a tobacco treatment specialist to develop a quit plan. Visits from the tobacco treatment specialists nearly double quit rates.

For many patients, the treatment provided by the program is the first they have received for their tobacco use. Patients have likely heard that they need to quit smoking, but many have little knowledge of what it takes to quit successfully. By providing evidence-based tobacco cessation support on which clinicians and patients can rely, the Tobacco Treatment Program is improving the health of all patients at MUSC Health.

Right: Dr. K. Michael Cummings, co-leader of the MUSC Hollings Cancer Center Tobacco Research Program

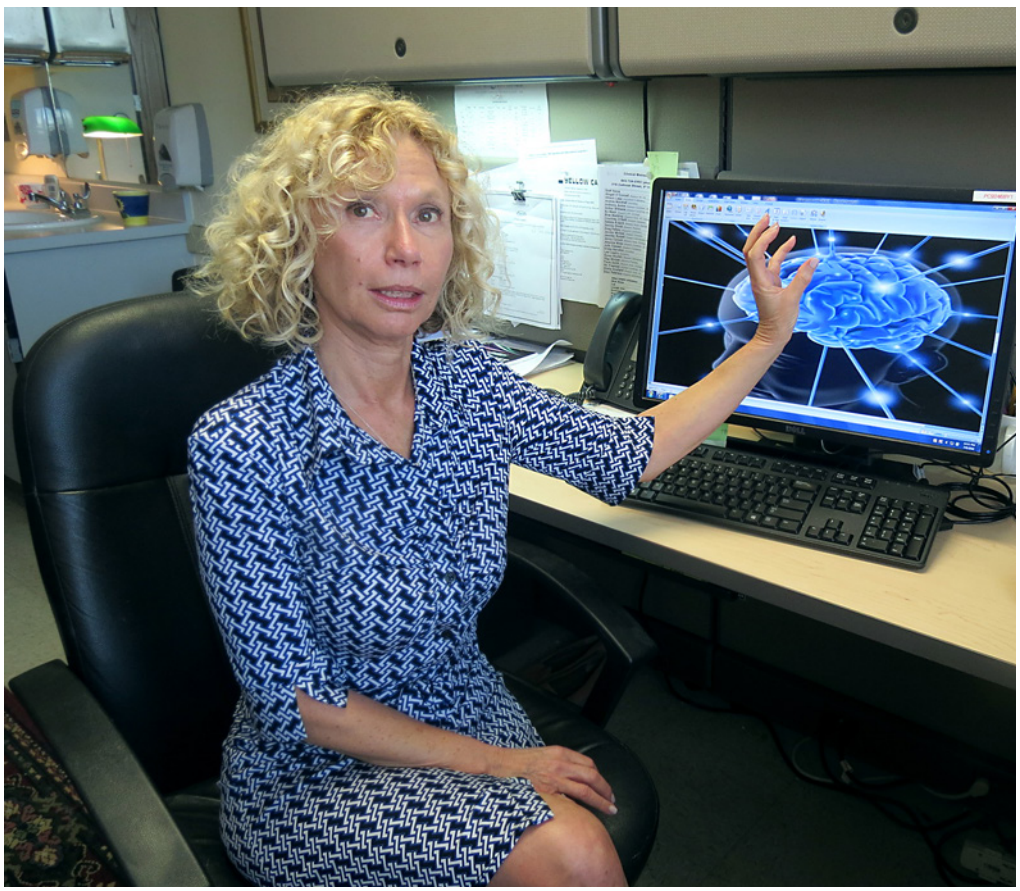
Transdermal Patch Combats TBI in Veterans

The day-to-day lives of U.S. veterans coping with memory problems resulting from traumatic brain injury (TBI) could improve as a result of the findings of a just completed clinical trial. All it could take is a transdermal patch the size of a credit card.

TBI affects 4 percent of U.S. veterans who served overseas from 2000 to 2011. Improved armor protected many soldiers from life-threatening combat injuries but left them to cope with TBI. Symptoms resolve in most affected veterans, but some develop long-term changes in acetylcholine firing in brain regions responsible for memory retention and problem solving. These changes often affect work and family life, complicating a veteran's transition back to civilian life.

The trial was led by psychiatrist Olga Brawman-Mintzer, M.D., who studies brain connectivity in degenerative brain disorders and holds a joint appointment at the MUSC Department of Psychiatry and Behavioral Sciences and the Ralph H. Johnson Veterans Affairs Medical Center. The medication in the patch is rivastigmine, a cholinesterase inhibitor that prolongs acetylcholine firing in the brain. Rivastigmine has been approved as a treatment for memory problems in Alzheimer's disease and Parkinson's dementia, first in pill form and later as a transdermal patch that could be worn 24 hours a day. The patch keeps rivastigmine constant in a patient's bloodstream, which allows him or her to absorb higher total doses with reduced side effects.

Brawman-Mintzer hopes the results of the phase 3, double-blind, placebo-controlled clinical trial—to be published in early 2017—will show that veterans with TBI have better memory with the patch. Even more importantly, she hopes this simple intervention will translate into better everyday functioning and quality of life for all U.S. veterans with TBI.



Dr. Olga Brawman-Mintzer led a clinical trial of a transdermal patch containing rivastigmine in veterans with TBI

Bettering Sickle Cell Care Through Implementation Science

In 2016, MUSC Health was one of eight clinical centers in the nation awarded funding by the National Heart, Lung, and Blood Institute as part of the Sickle Cell Disease Implementation Consortium (SCDIC). These grants are the first of their kind dedicated to testing implementation strategies that could boost health outcomes for U.S. teens and adults with sickle cell disease (SCD).

While most U.S. children with sickle cell disease survive to adulthood, the transition from pediatric to adult care is often challenging. Researchers are already familiar with some of the barriers: frequent use by patients of emergency rooms instead of clinics, poor follow-up after hospital discharges, and limited access to hydroxyurea—an FDA-approved drug that helps boost survival and reduce pain. However, other barriers to care are less clear.

These grants will support the work of researchers who will develop and test the effectiveness of strategies appropriate for the communities their clinical sites serve. It is hoped that the project, which will entail collaboration among the sites, will lead to more effective evidence-based guidelines for administering sickle cell care and ultimately help save lives in this population of great need.

This award recognizes both MUSC's expertise in implementation science as well as its clinical leadership in treating SCD. Cathy L. Melvin, Ph.D., who has more than a decade's experience with dissemination and implementation science, serves as principal investigator/project director for the grant, which is housed in the Department of Public Health Sciences. Pediatric hematologist Julie Kanter, M.D., who directs sickle cell research at MUSC Health and has extensive experience caring for SCD patients in rural South Carolina, co-led a team from the Colleges of Medicine, Nursing, and Health Professions to develop the grant and also serves as a principal investigator.

Dr. Julie Kanter (left) checking on a patient.

Children waiting outside a health clinic in Tanzania.

Study in Tanzania Tests Way to Reduce Stigma of HIV Testing

In October, MUSC's Center for Global Health received a $3.1 million grant from the National Institutes of Health to study an integrated approach to screening and treatment for HIV, diabetes, and hypertension in Tanzania. This five-year trial is a collaborative effort between MUSC, Clemson University, and Muhimbili University of Health and Allied Sciences in Tanzania.

Michael D. Sweat, Ph.D., professor of Psychiatry and Behavioral Sciences at MUSC and director of the Center for Global Health, is the principal investigator for the study. "Global health is everyone's health," said Sweat. "The greatest burdens of disease in the world—HIV, diabetes, and hypertension, among others—know no borders. This grant will enable us to discover better and more efficient ways to address these threats to health, no matter where they arise."

Sweat has worked with American and Tanzanian scientists and other colleagues since 1994 to study ways to increase HIV screening and care in Tanzania.

The success of HIV programs depends upon the effective identification, enrollment, and retention of HIV-positive patients, but there are numerous barriers at every point in this care continuum. HIV-centric programs carry a stigma, patients' transportation to the HIV clinics can be a problem, and patients tire of repeated visits to learn whether they have become eligible for HIV treatment.

Chronic non-communicable diseases such as diabetes and hyptertension are another growing global epidemic, accounting for 38 million deaths annually, with three quarters of those deaths occurring in low- and middle-income countries. The study will explore the integration of diabetes and hypertension screening into HIV screening and care. An earlier 12-month study led by Sweat found a 97 percent increase in HIV testing with this approach, a finding that is relevant throughout the world, including rural, poor areas of the U.S.

Sweat's collaborators will be Clemson University's Department of Bioengineering, which has worked with Arusha Technical College in Tanzania in the past to develop low-cost health technology solutions for resource-poor settings, and Muhimbili University of Health and Allied Sciences, which will provide clinical services and collaborate on data collection and analysis.

Delphine Dean, Ph.D., Gregg-Graniteville Associate Professor of Bioengineering at Clemson University, will direct the development of low-cost, diagnostic devices in her laboratory and provide technical support to the health clinics in Tanzania. Dean's laboratory recently developed a low-cost glucometer designed to print, on an inkjet printer, test strips on filter paper loaded with reagents to which a drop of blood is applied to determine the patient's blood sugar level. A patent on the glucometer was filed through the Clemson University Research Foundation.

"The lack of medical equipment, devices and tests in resource-poor areas such as rural Tanzania limits clinicians' ability to diagnose and treat," said Dean. "By working together, we can improve accessibility to technology and improve global health."

Patient enrollment is projected to begin in the fall of 2017.

Dr. Michael Sweat, director of the MUSC Center for Global Health

Susan K. Newbold, Ph.D., RN-BC, FAAN, FHIMSS., director of the nursing informatics boot camp

Nurse Informatics Training

In December 2016, MUSC Health hosted a nursing informatics boot camp, an intensive two-day course focused on informatics trends and issues. The course outlined potential careers for those interested in further studying to become board-certified informatics nurses. The boot camp also offered guidance for those just curious about this specialty. Attendees learned key concepts in informatics, information technology and management, and data security.

Medical institutions have a growing need for board-certified nurse informatics specialists. In this multidisciplinary field, nurses investigate how biomedical data and knowledge can be better used to solve problems and improve decision making in health care. For instance, nurse informatics specialists work with information systems that capture patient care data to devise more user-friendly, efficient electronic tools for use by clinicians.

"Applying the nursing informatics process gives us the ability to improve workflow for our health care team members, implement technology at the point of care, and design a way to make sense of all the information in front of us," said Lisa Ihnken, MEd, BSN, RN-BC, director of informatics and system education. "The goal is to make it easier for us to improve the outcomes of our patients."

The workshop was led by Susan K. Newbold Ph.D., RN-BC, FAAN, FHIMSS, a health care informatics consultant. Newbold helped establish nursing informatics as a separate professional discipline within the broader field of health informatics. "We were privileged to have her partner with us to provide this great educational workshop, which is part of our continuous learning and striving for clinical excellence in the nursing practice that we provide," said Ihnken.

"The boot camp speaks to how we support nurses to gain certification; nursing certification is a standard of Magnet," said Andrea Coyle, MSN, MHA, RN, NE-BC, who manages MUSC Health's Magnet Program. In 2015, MUSC Health achieved Magnet® recognition from the American Nursing Credential Center. "Our hope is that we begin creating an environment where our frontline nurses are competent in nursing informatics. In health care today, it's very important to understand all of the elements of clinical informatics and how they are integrated in our health delivery system."

Educating Tomorrow's Primary Care Physicians

With the advent of the patient-centered medical home, primary care physicians (PCPs) are assuming the role of the patient's primary advocate and guide to the health care system. Unfortunately, PCPs are in short supply. South Carolina will need 835 more PCPs by 2020, according to estimates by the Robert Graham Center in Washington, D.C. Two recent joint educational initiatives by MUSC and its affiliates aim to attract PCPs to rural South Carolina, offering them the prestige of an appointment at an academic medical center and the clinical opportunity of a community-based practice.

The Tidelands Health MUSC Family Medicine Residency Program

The Tidelands Health MUSC Family Medicine Residency Program, accredited in October, offers residents just such a hybrid experience. Residents will rotate to MUSC for subspecialty training such as pediatrics and electives but will reside in the Murrell's Inlet area and practice at the new family medicine center being built by Tidelands in Horry County. The first class of eight residents will begin in July 2017.

The new center is being built in an area that is both a rural health professional shortage area and one of the fastest growing areas in the U.S., with more than 20,000 moderate-income homes going in within five miles of the center.

Placing a residency program in a health professional shortage area is a first step toward meeting the growing demand for primary care. "Most residents stay within 60 miles of where they train," said Terrence Steyer, M.D., chair of the Department of Family Medicine at MUSC and one of the architects of the program. "One way to begin to address shortages is to train people in rural areas."

The program, which includes faculty from both MUSC and Tidelands Health, provides residents the leadership skills they will need to run a successful practice in today's health care environment. For example, all residents will be required to earn at least a green belt in Lean/Six Sigma, a methodology for driving the waste out of care while maintaining quality.

The program will also cultivate resilience in the residents, providing them tools for maintaining a work-life balance and managing stress. For example, they will be able to attend fitness classes alongside attending physicians and will be given a fitbit and a free gym membership.

"Our state needs well-trained PCPs who are equipped to manage the stresses of delivering primary care, and we need to place them in rural health care shortage areas," said Steyer. "This program combines all the things I believe in to make South Carolina a healthier place to live."

An architect's rendering of the new family medicine center being built by Tidelands Health in Horry County.

The MUSC-AnMed Health Clinical Campus

MUSC's new clinical campus, located four hours north of Charleston at AnMed Health in Anderson County, will provide the core clinical education for 12 third-year and 12 fourth-year medical students annually. AnMed Health is a 561-bed, not-for-profit health system serving the upstate of South Carolina with more than 400 physicians and 3,700 employees. Plans are underway for a new 5,000 sq. ft. education suite that will be completed in the spring of 2017. This innovative space will include dedicated didactic areas, personalized study space, lounge space, and a fitness area for students.

Anderson County and portions of the city of Anderson are designated as both medically underserved and health professional shortage areas. "Educating medical students in this part of the state provides an incredible opportunity for students to acquire valuable experience in primary care and service-learning," said Stoney Abercrombie, M.D., who has been appointed as the MUSC dean for the clinical campus. Last month, for example, students participated in the Hispanic Health Fair and assisted in identifying untreated patients who were then connected with local resources for follow-up care.

AnMed Health has provided MUSC students with community-based family medicine rotations and elective rotations for more than 40 years. "MUSC students have always expressed a high degree of satisfaction with the teaching, the learning environment, and the resources provided at AnMed Health," said Donna Kern, M.D., senior associate dean for medical education in the MUSC College of Medicine. "We are delighted to be taking this next step in the evolution of this program."

Raymond N. DuBois, M.D., Ph.D., the dean of the MUSC College of Medicine, supports the collaboration wholeheartedly: "With dedicated, enthusiastic faculty and abundant clinical resources, the new clinical campus provides excellent, community-based clinical education for our students."

The health system includes AnMed Health Medical Center, an acute care hospital that has earned the prestigious Magnet® designation. The latest *U.S. News & World Report* listed AnMed Health among the best hospitals in the state of South Carolina, second only to MUSC, and for several years Health Grades has ranked AnMed Health among the top 50 hospitals in the nation in patient safety and clinical effectiveness.

Third-year medical students at AnMed Health learn patient care skills in a simulation laboratory.

Faculty Development Program Aims to Improve Mentoring

The MUSC Department of Medicine continues to enhance an innovative program that guides junior faculty step by step through a goal-setting and mentoring process, providing them with the resources that can help them move up the academic ladder.

The Faculty Development Program, created in 2013, is a nationally recognized model for aligning each junior faculty member's annual goals, mentoring, and evaluations with departmental priorities. To provide transparency and accountability, each faculty member at the associate level and under completes an annual review with specific achievable goals that are reviewed with a mentor.

This strategy is a departure from the traditional sink-or-swim model for academic promotion. "We used to expect that you'd do everything on your own," said Gerard A. Silvestri, M.D., vice chair of medicine for faculty development. "We've found that doesn't work so well."

All too often, junior faculty members have incomplete goals that are not fully aligned with their mentor's or the department's goals, limiting their chances of success. The program guides junior faculty through the goal-writing process, offering detailed examples of definable goals that would be actionable within specific time frames. The mentor and faculty member meet to ensure that annual goals and benchmarks for evaluation and promotion match departmental priorities and can be completed. Silvestri calls this process "academic detailing" for faculty development.

The program has been successful on many levels. "One of the most notable results of the program has been a dramatic increase in the number of junior faculty members obtaining career development awards from the NIH and other agencies over the past two years," said Don C. Rockey, M.D., chair of the Department of Medicine.

The program has also already helped educate junior faculty about academic career advancement. "Over the past three years, we've seen an increase in the percentage of faculty who understand the College of Medicine's promotion criteria from about 60 percent to about 90 percent," said Silvestri. "In the end, it's really about faculty satisfaction and retention. You want good people to stay, and you hope that reaching their goals will lead them to want to stay." The program's website provides an increasingly robust database that could offer insights into why certain junior faculty advance and others do not. To learn more, visit http://bit.ly/2fnn63w.

Dr. Gerard Silvestri, vice chair of medicine for faculty development

Leadership in Academic Medicine Program

Academic health care is changing at a rapid pace, requiring creative leadership more than ever. That's why Department of Medicine Chair Don C. Rockey, M.D., appointed Elisha L. Brownfield, M.D., associate professor of Internal Medicine, to lead the team that created a nine-month interactive course to build a stronger culture of leadership.

In September 2016, the Department of Medicine's LEAD (Leadership in Academic Medicine) Program began its third academic year. Eligible participants include faculty and staff from the Department of Medicine and individuals from other departments and colleges across the enterprise. Now, the LEAD program is becoming a template for leadership development across MUSC.

Over the past decade, some of the best academic health institutions in the nation have increasingly focused on leadership development, noted Kathy Church, owner and principal consultant with Strategic Focus Associates. She has collaborated with Brownfield to design and refine the LEAD program.

Research has identified a number of proven and effective leadership behaviors that people can study, practice, and implement. The LEAD program begins with an emphasis on individual personal development. During the first session, participants undergo a "360 self-evaluation," which is a leadership review from their employees, peers, and bosses.

"Participants take a look at areas where they are doing well, and then some places where they might want to change some of their behaviors in the workplace," said Brownfield. After the 360 self-evaluation, an executive leadership coach provides individual guidance by telephone. "If participants develop more effective leadership skills, they can become transformative leaders who, in turn, can transform employees working under them," added Brownfield. In subsequent sessions, the LEAD program focuses on skills needed to work with teams and to negotiate differences among team members.

First LEAD class (2014-2015). Dr. Elisha Brownfield, who led the team that created the course, is third from the right on the front row.

> "With so much change now in all of the mission areas in academic medicine, strong and committed leadership is more important than ever before."—Dr. Don C. Rockey

"With so much change now in all of the mission areas in academic medicine, strong and committed leadership is more important than ever before," said Rockey.

In January 2017, Brownfield and Church are adapting the LEAD program for about 30 strategic leaders across MUSC. After undergoing the 360 self-evaluation process, these leaders will study the university's leadership culture, design a vision for a new leadership culture, and develop a strategy to create it.

Co-Executive Editors
Patrick J. Cawley, M.D., MHM, FACHE
Chief Executive Officer, MUSC Health
Vice President for Health Affairs

Raymond N. DuBois, M.D., Ph.D.
Dean, College of Medicine

Medical Editor
Daniel A. Handel, M.D., MBA, MPH
Chief Medical Officer and
Executive Medical Director,
MUSC Medical Center

Managing Editor
Kimberly McGhee
mcgheek@musc.edu

Medical Science Writers
Sver Aune
Dawn Brazell
Lindy Keane Carter
Katherine Hendrix
Lauren Hooker
Kimberly McGhee
Susan Hill Smith
John H. Tibbetts

Photographers
Sarah Pack
Anne Thompson
Brennan Wesley

Medical Illustrator
Emma Vought

Digital Communications
Ethan Fugate
Helen Smith

Design services provided by
Network Media Partners, Inc.

Visit MUSChealth.org/YIR-2016 for the online edition of the 2016 MUSC Health Year in Review.

Visit MUSChealth.org/pn/Subscribe to subscribe to *Progressnotes*, the quarterly medical magazine of the Medical University of South Carolina. The Year in Review is the winter issue of *Progressnotes*.

PROGRESSNOTES

Progressnotes, the quarterly medical magazine of the Medical University of South Carolina, highlights clinical and research innovations at MUSC. To receive an email alert when a new issue is published or when an article is published ahead of print, visit **MUSChealth.org/pn/Subscribe**

To refer a patient to the MUSC Health, call MEDULINE at 800-922-5250 or 843-792-2200.

MUSC Health
Medical University of South Carolina

Changing What's Possible