

# Carilion Medicine

In partnership with the Virginia Tech Carilion School of Medicine and Fralin Biomedical Research Institute at VTC



From  
**HERE**  
to  
**THERE**

*Tales of medical journeys, both geographic and metaphorical*



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CARILION MEDICINE

FALL 2019/WINTER 2020

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I REMEMBER, AS AN OB/GYN RESIDENT, working the week of Christmas. The other resident covered New Year's.

Driving to work early Christmas morning, I kept thinking of the unbelievable dinner my mother was making in the Poconos and I would be missing—turkey with homemade stuffing, mashed potatoes, glazed carrots, the best creamed onions, pumpkin pie—and the rare opportunity to spend time with my parents, my sisters, their husbands, and my niece and nephew.

As I grudgingly drove from my home to the hospital, my self-pity and woe increased with each passing mile. Why did I have to go to work? Why did I have to leave the warmth of home? Why did I have to miss my favorite holiday?

Then something happened. Suddenly, at a red light on the corner of Cedar Crest and Tilghman, I had a revelation: *I'm* not going to the hospital with a personal emergency, *I'm* not riding in an ambulance, *I'm* not visiting the hospital to see a loved one. I was going to the hospital because I had the gift of good health, medical skills, and the fortune to care for others on a day that they too would have preferred to spend at home.

It wasn't long after I arrived at the hospital that we received a maternal-fetal transfer from, of all places, the Poconos. The patient was a young, expectant mother, sick beyond belief. Sadly, she ended up losing her 16-week-old fetus to a septic miscarriage.

In that instant I went from being a physician who gets to share the joy of delivering healthy newborns to a palliative care doctor who had to deliver a terminal diagnosis and peaceful death.

I felt so ashamed that I'd earlier been wallowing in self-pity. And I learned a profound lesson that I carry with me to this day: The practice of medicine is about *giving*, not taking. It's about caring for people at their most vulnerable times. It's about seeking to restore their health and giving thanks for mine.

Now, more than 30 years later, every day when I put on my badge, I'm motivated by a strong sense of purpose. The work those of us in medicine do is not about us. It's about those we serve.

At Carilion Clinic, our not-for-profit health system, service is ingrained in our mission. From our founding in 1900 as "the little hospital on the hill" to today's nationally ranked health system, we've stayed true to our mission of service.

This issue of *Carilion Medicine* speaks to that commitment through the transformational journeys you'll find on its pages. These journeys range from literal ones to metaphoric ones; they even include literal journeys—like my own from home to the hospital that early morning—that turn metaphoric.

I'm grateful for the opportunity to engage in meaningful work and to share my journey with colleagues who also find deep fulfillment and joy meeting the needs of others.

**Patrice M. Weiss, M.D.**  
Chief Medical Officer and Executive Vice President  
Carilion Clinic

## Carilion Medicine

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*Carilion Medicine* is published twice a year at:  
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Carilion Clinic is a nationally ranked integrated health system headquartered in Roanoke, Virginia. Its flagship, Carilion Roanoke Memorial Hospital, is the clinical affiliate of the Virginia Tech Carilion School of Medicine and Radford University Carilion.

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### On the pulse of the Carilion Clinic community

# in brief

## CENTER TO PROVIDE ADVANCED CANCER CARE

Carilion Clinic is building a new, world-class cancer center in Roanoke to give patients in the region easier access to the most advanced technology and treatments available. Nancy Howell Agee, president and chief executive officer of Carilion, and her husband, Steven Agee, have donated \$1 million to kick off an ambitious fundraising campaign for the building.

"Cancer care has long held a special place in my heart," said Nancy Agee. "Steve and I are taking this step now to enhance care in our region, building upon the dedicated work of those who have come before us. We're committed to offering exceptional care to our neighbors in years to come."

During her 40-year career with Carilion, Agee worked as a clinical nurse specialist in oncology before going into administration. Her father died from cancer, and her husband is a survivor.

The Carilion Clinic Cancer Center is intended to offer a warm, caring environment for patients at the same time it opens opportunities for leading-edge



**PERSONAL COMMITMENT:** Nancy Howell Agee and Steven Agee review the site of the Carilion Clinic Cancer Center. Their \$1 million seed gift is intended to spark broader fundraising support for the center.

research and clinical trials. The center is expected to cost upward of \$100 million.

"This is a big step forward for cancer care in our region," said James Hartley, chair of Carilion's Board of Directors. "Nancy and Steve have long been ambassadors of our community—what a tremendous way of showing love to their

neighbors. This cancer center will play an integral role in providing high-quality care close to home for us all."

The four-story building will stand at the western entrance of the rapidly growing health care and technology campus anchored by Carilion Roanoke Memorial Hospital, the Virginia Tech Carilion School of Medicine, and the Fralin Biomedical Research Institute at VTC.

The pace of fundraising will determine how quickly the center is built. The Agees said they are making their gift as a gesture of thanks to the many people who care for those with cancer, and as an encouragement to other potential contributors.

"With the many blessings we have experienced in our lives comes the responsibility to lift others up," said Steven Agee, who serves as a judge on the 4th U.S. Circuit Court of Appeals. "We hope that this seed gift will inspire our community to advance cancer care in our region for generations to come."

[CarilionClinic.org/carilionmedicine](https://www.carilionclinic.org/carilionmedicine)

### collaboration

## Children's National Campus Expansion

Children's National Hospital and Virginia Tech have launched a formal partnership that will include the construction of a 12,000-square-foot Virginia Tech biomedical research facility within the new Children's National Research & Innovation Campus.

The campus is an expansion of Children's National, which is located in Washington, D.C., and is set to open its first phase in December 2020.

Carilion Clinic and Children's National have an existing collaboration for provision of certain specialized pediatric clinical services. The more formalized partnership between Virginia Tech and Children's National is expected to drive the already strong Virginia Tech Carilion partnership, particularly for children's health initiatives.



## Carilion Children's Outpatient Practices to Find a New Home

Carilion Clinic will lease 150,000 square feet at Tanglewood Mall in Roanoke County, supporting the region's evolving innovation efforts. The space will become home to outpatient practices of Carilion Children's and may ultimately house other clinical services as well.

"After years of adding more and more specialized pediatric services for our community, we're excited to have a new home for those services," said Nancy Howell Agee, president and chief executive officer of Carilion. "More than a dozen pediatric and adolescent specialties are represented at Carilion now. This development will help us make access easier for our patients and their families."

The Tanglewood Mall space has two other appealing factors: It is centrally located and has ample parking. The space will allow Carilion Children's to consolidate outpatient specialty practices, thereby improving coordination of patient care among those practices.

"This is an exciting day for Carilion Children's," said Kimberly Dunsmore, M.D., chair of Pediatrics at Carilion. "This new facility will set the stage as pediatric care in our region continues to transform and grow. Our goal remains the same: to provide specialized care, close to home, for the children in our community who depend on it."

Extensive renovation of the space is expected to begin in the winter of 2020, with the new Carilion Children's location operational within 18 to 24 months.

The leased space was last occupied in 2018 by J.C. Penney and Miller Motte Technical College.

The Carilion Children's renovation project is expected to cost more than \$30 million. This expenditure is included in the estimated \$1 billion Carilion plans to invest in capital projects across the communities it serves during the next seven years.

[CarilionClinic.org/carilionmedicine](https://www.carilionclinic.org/carilionmedicine)

**EASY COMMUTE:** Pediatric outpatients will have a shorter distance to travel to their appointments when Carilion Children's moves to Tanglewood Mall.



## Neuroscience Conference to Return



In 2016, during the first scientific gathering of its kind in the world, thought leaders in medical care and scientific research from across the United States and Nordic countries convened in Roanoke to explore the challenges and promise of applying personalized medicine to improve brain health.

Now, after a follow-up meeting in Oslo, Norway, in 2018, the trans-Atlantic lineup of neuroscientists and clinicians will return to Roanoke. The Precision Neuroscience Conference will be hosted by the Fralin Biomedical Research Institute at VTC at the Hotel Roanoke & Conference Center on May 20–22, 2020.

Precision neuroscience takes into account that while general patterns in brain development and function do exist across the lifespan, the individual nuances of genetics, epigenetics, lifestyle and social influences, and environmental factors affect each person's brain differently.

The conference's keynote speakers will be two world-renowned scientists, Carol Mason, Ph.D., a National Academy of Sciences member who uses neuroscientific techniques to recreate conditions that occur only during early brain development, and Jan Hoeijmakers, Ph.D., acclaimed for cloning the first human DNA repair gene to help curb medical conditions linked to cancer and aging.

"This series of international conferences provides the opportunity for deeper exploration and discussions of precision-based approaches to preventions, diagnostics, and therapeutics for brain disorders," said Michael Friedlander, Ph.D., executive director of the Fralin Biomedical Research Institute and vice president for health sciences at Virginia Tech.



## VIRTUAL COACH FOR SURGEONS IN TRAINING

The Integrated Translational Health Research Institute of Virginia (iTHRIV) has awarded its first round of seed-grant funding. Among those projects is a new, intelligent virtual coach to help surgeons-in-training learn minimally invasive procedures.

Before attempting laparoscopic procedures in the operating room, surgeons-in-training spend hours practicing skills and doing simulation exercises. The iTHRIV grant will allow a multidisciplinary team to develop a device that integrates eye-tracking technology and machine learning to provide feedback during laparoscopic surgery simulations.

Team members include Nathan Lau, Ph.D., an assistant professor of industrial and systems engineering at Virginia Tech; Laura Barnes, Ph.D., an associate professor of engineering systems and en-

vironment at the University of Virginia; Sarah Henrickson Parker, Ph.D., a research assistant professor at the Fralin Biomedical Research Institute at VTC and senior director of Carilion Clinic's Center for Simulation, Research and Patient Safety; and Shawn Safford, M.D., chief of pediatric surgery at Carilion Clinic.

The virtual coach device will help surgeons improve their minimally invasive surgery skills more quickly, which could lead to reduced operating time, better patient outcomes, and enhanced implementation of leading-edge surgical techniques.

A partnership of Virginia Tech, Carilion, the University of Virginia, and Inova Health System, iTHRIV is supported by a five-year, \$23 million grant from the National Institutes of Health's National Center for Advancing Translational Sciences.

## appointment

### Radford Names Leader in Health Sciences



Radford University has named Teresa Ann Conner, P.T., Ph.D., M.B.A., as its new associate provost for health sciences.

Dr. Conner was most recently founding dean and professor in the College of Health Sciences and Professions at the University of North Georgia.

"We're delighted to welcome Dr. Conner," said Jeanne Armentrout, executive vice president and chief administrative officer of Carilion Clinic. "She'll make a great addition to Radford University Carilion's growing health sciences campus and the work we will do together."

## briefings

### High Wired Act



The College of Healthcare Information Management Executives (CHIME) has once again given Carilion Clinic its Most Wired recognition. The honor is based on an annual survey to assess how effectively health care organizations apply core and advanced technologies into their clinical and business programs to improve health and care in their communities.

### Hospital Honors



Carilion Roanoke Memorial Hospital was ranked third in U.S. News and World Report's latest listings of best hospitals in Virginia. The hospital also rated "High Performing" in 11 categories of care, putting it among the nation's elite 13 percent of hospitals.

### A New Role

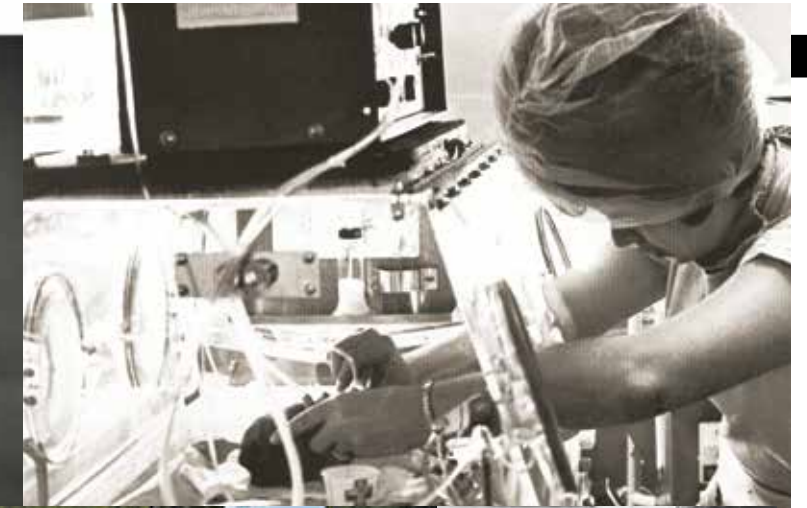


Dr. Nathaniel L. Bishop has been named senior associate dean for diversity, inclusion, and student vitality at the Virginia Tech Carilion School of Medicine. He most recently served as president of Jefferson College of Health Sciences, prior to its integration with Radford University in 2019. "We are thrilled to have Dr. Bishop remain an integral part of the Virginia Tech Carilion School of Medicine," said Lee Learman, M.D., Ph.D., dean of the school. "We will benefit greatly from his leadership and expertise."



## a moment in history

**THE BREATH OF LIFE:** Dr. Leon Arp, photographed in 2012 with the infant respirator he had invented nearly five decades earlier, was inspired to develop the device after nearly losing one of his sons to respiratory distress syndrome.



**A LABOR OF LOVE:** The Arp Respirator saved the life of Carrie Spolski, shown in her father's arms (right) and, decades later, with Dr. Arp (top left). Top right: A Roanoke Memorial Hospital nurse checks on a baby. Above, Dr. Arp works with Dr. Andre Muelenaer, now chief of pediatric pulmonology at Carilion Children's.

## A Breath of Inspiration

Leon Arp helped save the lives of hundreds of newborns with a respirator tailored to their tiny lungs.

When Leon Arp's twin sons were born prematurely in 1961, he was alarmed to see one of them taking rapid and labored breaths. At the time, respiratory distress syndrome—which affected 25,000 premature infants a year in the United States—was the leading cause of death in the first week of life.

The baby survived, but that dangerously close call stayed with Dr. Arp.

"The machinery that was available was just too slow, too insensitive, too inaccurate," Dr. Arp later said. "So I decided to do something about it!"

Dr. Arp, then a graduate student in industrial education, pressed his son's pediatrician into teaching him the anatomy and physiology of the syndrome. He

learned that the absence of a protective substance called surfactant had caused his son's lungs to stiffen. In his fight for oxygen, the infant had dramatically increased his breathing rate.

Dr. Arp also learned that infants with respiratory distress syndrome took as many as 120 breaths a minute, a rate far faster than existing adult respirators could handle. He realized that a breathing apparatus for infants would need to be incredibly sensitive.

So Dr. Arp developed a sensor that would detect the minuscule negative air pressure that signaled the beginning of each inhalation. The sensor would then trigger the respirator to send the exact right volume and concentration of oxygen into the tiny lungs. The sensitivity and quick response time allowed

Dr. Arp's respirator to follow the infant's rapid breaths, unlike the rate-controlled method used in adult respirators.

The sensor was not Dr. Arp's only innovation. Rather than using the bellows approach of forcing air into a baby's lungs, which damaged fragile tissue, Dr. Arp's respirator delivered the oxygen gently. Finally, instead of using endotracheal tubes, which posed a risk to infants, Dr. Arp used a nasal mask.

Dr. Arp completed his doctorate and, in 1966, joined Virginia Tech as a mechanical engineering professor, taking his invention with him. He then partnered with pediatricians at Roanoke Memorial Hospital and the Medical College of Virginia.

From June 1967 to October 1968, the team applied Dr. Arp's respirator and his methods to 200 infants in respiratory dis-

tress. They found that those treated with the respirator had a survival rate of 86 percent, compared with only 62.8 percent of the infants who had not been treated with it. The team published their results in 1969, in consecutive editions of the journal *Anesthesia and Analgesia*.

The National Society of Professional Engineers named the Arp Respirator one of the top five engineering achievements of 1969, not far behind the Apollo moon landing and the Boeing 747.

The following year, *Life Magazine* documented the case of a baby in respiratory distress. The story followed agonizing hours for another father, Paul Spolski, an Air Force sergeant whose daughter, Carrie, had been born three months early.

"The doctor came out and told me she was having problems," Spolski said years

later. "He basically said, get ready for the worst. The air went out of me."

Fortunately, the pediatrician remembered reading about the Arp Respirator. He reached out to Dr. Arp, who was able to board a diverted Air Force jet and arrive at the Langley Air Force Base hospital within the hour. Almost immediately the respirator—which *Life Magazine* called "an unimpressive-looking box not much bigger than a clarinet case"—eased baby Carrie's breathing. Within four days, she was strong enough to go home.

Dr. Arp believes the invention ended up saving the lives of at least 200 infants.

In the early 1970s, the respirator was licensed by a medical-device manufacturer that converted the machine back into one that was insensitive to the rapid breathing rate of infants in respiratory distress.

Yet the device's legacy persisted in the continued research of Dr. Arp and others, including Andre Muelenaer, M.D., then a Virginia Tech undergraduate studying under Dr. Arp and now chief of pediatric pulmonology at Carilion Children's and professor of practice in biomedical engineering at Virginia Tech.

Today, Dr. Muelenaer said, neonatologists can anticipate respiratory distress syndrome, deliver drugs that speed lung development, treat babies with artificial surfactant, and use a new generation of sensitive respirators that trigger gentle ventilation.

Even with all these advancements, Dr. Muelenaer added, "We're really practicing the principles Dr. Arp discovered and promoted in the '60s and '70s. His respirator made perfect sense."



# grand rounds

Education at Carilion Clinic and its affiliates



**ALL TOGETHER NOW:** The merger of the former Jefferson College of Health Sciences into Radford University became official in July 2019. Here, members of the first class of Radford University Carilion practice techniques in the indoor ambulance that serves as one of their classrooms.

## MORE TO LEARN



Carilion Clinic continues to add training opportunities for physicians and advanced clinical practitioners alike. Opportunities include:

**Residency Programs.** Carilion offers 13 residency programs in fields ranging from dermatology to neurosurgery, and from family medicine to psychiatry.

**Fellowships for Physicians.** In collaboration with the Virginia Tech Carilion School of Medicine, Carilion now offers 15 fellowship programs that are accredited through the Accreditation Council for Graduate Medical Education. The newest of these fellowships focus on rheumatology, surgical

critical care, hand surgery, and addiction medicine. In addition, the Fellowship Council recently granted a full three-year accreditation for an Advanced GI/Minimally Invasive Surgery Fellowship.

**Fellowships for Physician Assistants and Nurse Practitioners.** Carilion now offers six fellowship options for advanced clinical practitioners, including emergency medicine, orthopaedic surgery, urgent care and rural health, acute care surgery, and, more recently, hospitalist medicine and wilderness medicine. Unlike most programs nationally, Carilion's fellowship programs train physician assistants and nurse practitioners together rather than on separate tracks.

## WHITE COAT CEREMONY



In October, members of the Virginia Tech Carilion School of Medicine's Class of 2023 participated in their White Coat Ceremony.

"The purpose of the ceremony is to clarify for students that a physician's responsibility is both to take care of patients and to care for patients," said Aubrey Knight, M.D., senior dean for student affairs at the school.

While many medical schools have their white coat ceremonies within the first week of studies, the Virginia Tech Carilion School of Medicine delays its ceremony until students complete their first block of study.

"It was a goal for our leadership team that this White Coat Ceremony would not merely be a celebratory event or photo-op," said Lee Learman, M.D., Ph.D., dean of the school. "We hoped to convey the significance of what wearing a white coat means to our patients and the community."

A special curriculum prepares them for the ceremony, and they write a set of their own guiding principles.

"The white coat becomes not only a rite of passage but also a symbol of the profession itself," Dr. Knight reminded the class. "So, as you have your freshly ironed, pristine white coats placed on your backs, may this not only serve to remind you of this next step in your journey to becoming an M.D., but also as a reminder of our responsibility to the health of our patients."



## outreach

### From Rural Health to Global Health

Miranda Gerrard so clearly loved the animals she cared for while growing up on cattle farms that it didn't take long for her Virginia Tech Carilion School of Medicine classmates to bestow upon her a loving



Miranda Gerrard examines a patient during a mission trip to El Salvador.

nickname: Moo-randa.

"Like the community in which I was raised, I was passionate about raising livestock," said Gerrard, now a third-year student. "But I became even more passionate about the people. While they were

tending to their crops and livestock, who was tending to them?"

Gerrard has since enjoyed using the school's problem-based learning approach to help bring an understanding of rural populations to her classmates. She has also been able to fuel her other passion—global health. In addition to a medical mission trip to El Salvador, she has participated in two research projects abroad.

First, she went to Vietnam to help Stephanie DeLuca, Ph.D., director of the Fralin Biomedical Research Institute's Neuromotor Research Clinic, train therapists in pediatric constraint-induced movement therapy techniques for children with cerebral palsy. Then she went to Haiti to assist with a project through the Virginia-Maryland College of Veterinary Medicine.

This year, Gerrard began her clinical clerkships, which she hopes will help narrow her focus on what field of medicine to pursue. No matter the specialty she chooses, she knows she wants to focus on rural or global health or both, to provide care to underserved communities.

"There was a sign in my old hometown that said, 'It takes a village to raise a child,'" Gerrard said. "That's really what it's like in a rural community. That's the community I want to give back to because they have done so much for me."





LIFE'S DRAMATIC JOURNEY FROM BIRTH TO DEATH is nowhere more evident than within the walls of a hospital. Rites of passage—from those first gentle sputters of newborns to the halting exhalations of the dying—take place night and day.

Bearing witness to those journeys are health care providers who seek to soothe, to support, to save.

Against that backdrop, care providers are undertaking voyages of their own. Some journeys last days or months, others years or even decades. Medical students graduate to residents, to attendings, to senior physicians. Nursing students become nurses,

respiratory therapists grow in their field, and physician assistants take on more and more responsibility. And, in the instance of Carilion Clinic's own leader, a candy-striper goes on to become an oncology nurse and eventually president and chief executive officer.

The pages of this special report capture less traditional odysseys in medicine. After becoming addicted to painkillers, a young woman follows an arduous path to sobriety, then becomes a certified peer recovery specialist in an opioid treatment program so she can help guide others to health.

A team of experts—including registered nurses trained in critical care, emergency physicians, and

other specialists—serve as traffic controllers, as they guide the transport of patients on helicopters, ambulances, and gurneys to hospital beds.

An orthopaedic surgeon who connects bone to sinew to muscle both on the operating table and on the trail shares his passion for the literal journey of Ironman triathlons.

And a nurse pioneers a sustainability program as a way to enhance the health of the community she serves.

Together these passionate providers blaze trails intended to help patients and community members along their own pilgrimages.

from



Tales of medical journeys,  
both geographic and metaphoric



**in  
their**

# Stories

**Carilion Clinic's peer recovery specialists are uniquely positioned to understand the steps and missteps in overcoming substance use disorder.**

**BY JESSICA CERRETANI**



**THE LONG AND WINDING ROAD:** When she was 21, Jen Hetzel had routine oral surgery that left her in debilitating pain—and vulnerable to the opioids she had been prescribed. It was after she gave birth to her first child that she embarked on the path to recovery.





IT'S A TYPICAL DAY ON CARILION ROANOKE Memorial Hospital's 5 West, and Jen Hetzel is making the rounds. Today, Hetzel, a certified peer recovery specialist, is checking in on patients receiving antibiotics for infections related to drug use. "How's your day going?" she asks one man. "Is there anything you need?" If the patient is amenable, she'll pull up a chair and sit with him for an hour or so, chatting about his experiences.

"We talk about how they feel and how those feelings affect their recovery," she says. But not everyone is ready to share. "If a patient doesn't want to talk to me, that's totally fine," she explains. "But I keep showing up anyway and letting them know I'm invested in their care."

That's not just lip service. Like other certified peer recovery specialists, Hetzel isn't just trained to provide support to patients struggling with substance use, mental health concerns, and other challenges. She's drawing on her own lived experience to motivate and inspire them.

"I'm using myself as an example to show people in the throes of addiction that there can be a positive way forward," she says. "I'm offering hope that even if they're struggling now, they can work through it, too."

## An Unlikely Addiction

It's a role Hetzel wouldn't have imagined for herself just a few decades ago. A good kid from a supportive middle-class family, she was popular, did well in school, and was a cheerleader—even dating a football player in what she calls a clichéd but typical teenage romance. "I'd venture to guess that no one ever expected me to develop a problem with addiction," she says.

Although she and her boyfriend experimented with prescription drugs as a way to relax and unwind occasionally, Hetzel says they were naive to their addictive potential and instead viewed pills as a mild alternative to alcohol. "We didn't recognize this as risky behavior," she says. "In my mind, it was similar to having a beer on the weekend. I never felt like I needed them."

That began to change when, at 21, routine oral surgery left Hetzel in debilitating pain. After having her wisdom teeth removed, she developed searing chronic jaw and ear pain that had seemingly no explanation. The 60 daily milligrams of Oxycontin that her surgeon had prescribed barely alleviated it.

When a specialist couldn't identify the source of the pain, she left his clinic in tears.

"I distinctly remember the doctor telling my mother that I was seeking drugs and making the entire thing up," she says. "Hearing these words devastated me and filled me with a sense of hopelessness and despair that's difficult to describe."

The next few years were filled with bone scans, physical therapy, and visits to pain management physicians—but the pain remained. Hetzel gradually began to misuse the opioids she was prescribed, desperate for relief and terrified the pain would get worse. Eventually, she was taking so much medication that she would run out of her monthly prescription in just three days. She found herself buying pills off the street just to avoid feeling sick—and to be able to pass the drug screens administered at the pain management clinic.

## The Turning Point

Five years later, Hetzel was still showing up for appointments at the pain management clinic and passing those drug tests, hiding her reality of substance use while keeping up the appearance of a model patient. That all changed one morning in 2013, when a pregnancy test revealed that her symptoms of nausea and fatigue weren't part of the withdrawal and addiction cycle to which she had become accustomed. She was five months pregnant and dependent on opioids. She knew she needed help.

But Hetzel wouldn't find it from her pain management provider, who told her the clinic didn't treat pregnant women and released her as a patient. Feeling guilty, ashamed, and alone, she made her way to a free clinic, and then a treatment program through Carilion Clinic that offered buprenorphine. "I knew I didn't have a choice," she says.

That July, her daughter was born, healthy and free of complications. "I stumbled my way into recovery because of her," Hetzel says, "and the incredible providers who gave me a solution I didn't know was possible."

She went on to have a second child and found a new oral surgeon to address her dental problems without using narcotics. Now six years into recovery, Hetzel says that substance use has permanently changed her life, both for better and worse. After her children's father died from his own addiction, she became even more determined to make a change.

"That gave me the shove to do something more," she says. Previously a stay-at-home mother, she began doing her own research on the opioid crisis and learned about the role of certified peer recovery specialists in treatment. "I was ready," she says, "to start giving back."



**Hetzel isn't just trained to provide support to patients struggling with substance use, mental health concerns, and other challenges. She's drawing on her own lived experience to motivate and inspire them.**

## A New Path

Certified peer recovery specialists are uniquely positioned to support people facing substance use disorder, mental illness, or other challenges, relying on their own personal experience while applying the skills they've developed through intensive education. Hetzel, who first heard about the profession from her own clinicians, underwent 72 hours of specialized training on how to work with people not yet in recovery. She also completed 500 hours of volunteer contact with patients—no easy feat for a single mother who lived an hour away from Carilion Roanoke Memorial Hospital. Yet it's the perfect calling for Hetzel, who views her struggles with substance use as a benefit to the profession.

"I believe my experiences have gifted me with the unique ability to meet someone in their darkest moments and offer tangible hope," she says, "because I can say 'me too' and 'you're not alone.'"

Indeed, a large part of the peer recovery specialist's job is to act as a role model while helping to remove the stigma that still surrounds substance use disorder and mental illness. "I didn't have a peer recovery specialist when I was in treatment, and I felt incredibly isolated and stigmatized as a pregnant woman," says Hetzel. "That's why I wanted to do this." While she sees a wide variety of patients, she finds that she especially relates to expectant mothers with substance use disorder. "That's my passion," she says.

Although the position is relatively new to Carilion, certified peer recovery specialists can already be found throughout Carilion Roanoke Memorial Hospital, from the Emergency Department to the inpatient units. Hetzel and her colleagues also work with outpatient, in-group settings, and in the community. But they all have lived experience that no amount of training or education can replicate. And they all have the same goal: "We always try to take on the role of advocates," Hetzel says.

That can mean helping people work to achieve goals for recovery, supporting their treatment, modeling healthy behaviors, serving as inspiration and motivation, and teaching them to advocate for themselves so they can obtain necessary services and care. They focus on helping people help themselves—all while treating their peers the way they would have wanted to be treated when they were in their shoes. They've been through similar situations, so they view relapse not as a failure, but as a bump in the road.

Persistence, says Hetzel, is key. "People with substance use disorders get written off all the time," she explains. "We want them to know that we want the best for them, and that we're never going to give up on them—ever."





**FAST ACTING:** Experts in the Carilion Transfer and Communications Center must be ready to respond quickly to any number of emergencies.



# Smooth operators

Carilion Clinic's patient transport command center is reducing inefficiency and stress and helping to save lives. **BY CHARLES SLACK**



# a

WOMAN ARRIVES

at a small medical clinic in rural southwestern Virginia, unresponsive and unable to speak. A blood clot smaller than a pea, lodged in her middle cerebral artery, has severely restricted the flow of oxygen-rich blood to her brain.

Two realities loom large: First, every delay in getting her to the proper treatment increases the likelihood that she'll lose vital functions, such as the ability to speak or to move an entire side of her body. Second, her best hope for full recovery lies at Carilion Roanoke Memorial Hospital, more than 60 mountainous miles away.

Still, the patient has a fighting chance. The physician picks up the phone and calls Carilion Clinic's Transfer and Communications Center, or CTaC. For the past eight years the CTaC has been the go-to command center for Roanoke Memorial as well as six other hospitals and multiple clinics across 20 counties in southwestern Virginia and southern West Virginia.



**RESCUE MISSION:** Carilion Clinic's Life-Guard, Virginia's first air ambulance service, provides 24-hour transport of patients.

## A Center that Never Sleeps

With more than 40 full-time employees, the CTaC operates 24 hours a day. At peak times, more than 20 workers—including registered nurses and emergency medical technicians trained in critical care—sit before expansive flat screens generating a constant flow of data on everything from the location of helicopters and ambulances and the traffic levels in units throughout the Carilion system down to which patients are likeliest to be discharged soon. Serving as Carilion's eyes and ears, it's their job to ensure that patients enter and leave the system as smoothly as possible.

And it's their job to be there when physicians in remote locations call needing urgent care for patients on the brink of death. The nurse who fields the call about the woman with the clot in her brain becomes a sort of symphony conductor responsible for ensuring that professionals throughout the system, performing many different functions, operate as a unified team.

"In certain situations, such as an aneurysm, ischemic stroke, trauma, or heart attack, a few minutes can save lives," says Paul Haskins, M.D., emergency medical physician at Carilion and CTaC's medical director. "You have to have the ability to arrange transport, have a place immediately ready to evaluate the patient, and intervene on their behalf."

The nurse's first step is to alert the transport team and ensure that a helicopter is available and ready to go. As the only Level I trauma center in a 150-mile radius, Carilion operates a fleet of three rescue helicopters.

In this case, the helicopter will replace a journey over winding country highways with a speedy flight lasting a few minutes. As the emergency crew prepares to take off, the R.N. turns her attention to ensuring the hospital is ready. In a traditional system, the first step might be to deliver the patient to the emergency room for evaluation—but that could cost precious time.

Instead, she alerts Carilion's specialized Stroke Center. Physicians from the Stroke Center's neurointerventional team speak directly with the clinic doctor to discuss the patient's condition.

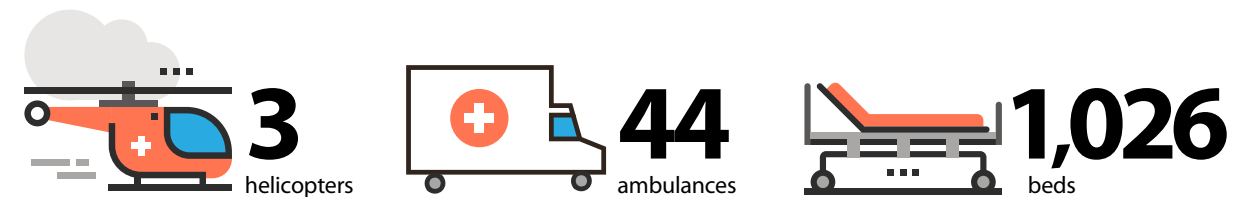
Meanwhile, the CTaC medic stays in touch with the helicopter crew about the weather conditions and estimated time of arrival.

"That way, the physicians know what timeframe they're dealing with," says Melanie Morris, R.N., senior director of CTaC. The specialists will be waiting for the patient the moment the helicopter lands.

## A Bed for Every Head

Behind the scenes, those precise operations are the result of years of training, new procedures, constant adjustments, and rethinking. The CTaC, located in Carilion's Parkview campus, resembles nothing so

Advanced tracking software plays a major part in the operations. The software helps Carilion Clinic's Transfer and Communications Center manage:



much as "an air traffic control center for the hospital," says Morris.

Advanced tracking software plays a major part in the operations. The software helps Carilion manage the three helicopters, 44 ambulances and, crucially, 1,026 beds.

While less dramatic than responding to a life-threatening emergency, bed management is every bit as vital to the quality of patient care. Like airplane seats, beds are at a special premium during busy times. Carilion's bed occupancy, which hovers above 90 percent year-round, spikes during flu season and other periods. Leaving empty beds unfilled, or overbooking beds in a crowded unit, can lead to problems similar to those of a packed airport terminal at Thanksgiving, yet with the added pressure that the occupants of those beds are dealing with serious medical issues.

In the CTaC control room, workers keep constant watch on the "bed board."

"We have a real-time view, refreshed every 30 to 60 seconds," says Morris. "We have eyes on every bed in all of our hospitals on all campuses."

When a doctor writes a discharge order or transfers a patient, the system receives an alert that a bed will be opening soon. As soon as the bed is empty, the software system instructs the environmental services team to start cleaning.

Back at the control center, Morris adds, "We can see what phase of cleaning the bed is in, and how close it is to getting ready." The moment the bed is cleaned, another alert gives the CTaC the green light to send the next patient to it.

## Emphasizing Human Cooperation

As impressive and useful as the technology is, the center could not function as it does without the close coordination of the humans who staff it. Indeed, the innovations around human behavior have as much or more to do with what makes the CTaC tick.

One of the key concepts is called "distributed situation awareness"—an idea that has become increasingly prevalent among "high-reliability organizations" such as NASA, maritime navigation units, air traffic control centers, and other operations requiring pinpoint movement and precision timing. The idea, essentially, is that specialists can't mind just their individual areas of expertise. For maximum efficiency and, in the case of a busy hospital, patient safety, they must remain fully aware of what's going on in all areas, and be ready and able to communicate and coordinate with others.

"Today's health system is too complex to train humans on all the interactions they need to have," says Paul Davenport, R.N., M.B.A., Carilion's vice president of emergency services and care management. Thus workers must be encouraged to move beyond rigid checklists and procedures and develop the ability to understand and react in real time to the needs of those around them. "The more you can integrate teams using technology and dashboards," Davenport adds, "the less you have to train a worker to notify someone else when something is happening."

## Breaking Logjams

Before CTaC, Carilion, like most busy health systems, struggled to adapt to ever higher caseloads. Despite their individual professionalism and desire to help patients, workers often created barriers and stress for one another. Some patients were staying longer than they needed to, or were admitted for conditions that might have been treated on an outpatient basis.

And because patients might enter the system through multiple portals, potential logjams were often not detected until they had already occurred. That meant added wait times for patients and their families, and stress for busy physicians spending too much time dealing with logistics rather than patient care.

"Our goal is to keep physicians off the phone and at the bedside as much as possible," Dr. Haskins says. "If



someone's asking for a cardiologist when what's needed is a cardiothoracic surgeon, that's a delay. Yet if you can eliminate those roadblocks, you'll have the right physician accepting a phone call from the transferring physician. They'll know they have all the services they need available to them, and they can just accept the patient."

While the principles of distributed situation awareness apply throughout the hospital system, the nerve center and primary driver is the CTaC. One of the most important steps in achieving that level of awareness was to move the transfer staff and the communications staff (responsible for transporting patients), once located in different areas, into the same large room.

"When we began to align these people and their functionality and teamwork, we began to have a more harmonious working environment," Davenport says. "Yes, we *can* accept your patient, we *do* have capacity, we *do* have a helicopter in route to you now. We know the ETA back to the hospital and what treatments we should start. Within one phone call, we can answer all those questions and help those who are trying to send new patients or transfer patients throughout the system."

## A Beacon of Success

The results have been remarkable. Within eight years, the center has eliminated 30 minutes of wasted time for each patient—or an astounding 720,000 hours per year. A vastly improved alert system for the Emergency Department has cut the time it takes to put patients in rooms by half, Dr. Haskins notes. And the CTaC has contributed to a .3-day reduction in the time patients spend in intensive care.

Such successes have caught the notice of the wider medical community in the United States and globally. Some 60 health systems from as far away as the United Kingdom and Singapore have made the trek to Roanoke in recent years.

In early 2019, after sending a team to Roanoke, Ohio's Kettering Health Network opened a \$10 million, 17,000-square foot command center using many of the same procedures and advanced tracking software to move patients around its system more efficiently.


## Buy-In from the Top

According to Davenport, one of the questions visitors most frequently ask is, "How do you get administrative buy-in for this?" In Carilion's case, the thinking behind CTaC came from the top.

More than a decade ago, Nancy Howell Agee, now president and chief executive officer of Carilion, formed a task force to investigate ways to better coordinate Carilion operations.



**TRAFFIC CONTROL:** The banks of screens in the center track a constant flow of data on everything from the location of helicopters and ambulances to which patients are likeliest to be discharged soon.

 **Within eight years, the center has eliminated 30 minutes of wasted time for each patient—or an astounding 720,000 hours per year.**

The CTaC is a natural extension of Carilion's commitment to constant improvement, informed by open and continuous communication across various medical disciplines and between clinicians and administrators. That's the idea behind Carilion's "dyad leadership" model, which pairs clinicians and administrators.

"As long as you can keep open lines of communication between the providers who are seeing the patients and the administrators who are overseeing the hospital system, then we all have an idea of our goals," Dr. Haskins says. "It's important that we're all moving in the same direction."

## Looking to the Future

While perfection is a goal, the CTaC remains a constant work in progress, Dr. Haskins says.

And that's not likely to change. Because health care is evolving so rapidly, solutions to today's challenges may become outdated with breathtaking speed. And

success breeds its own new complications. Thanks to CTaC's efficiencies, Carilion in recent years has been able to accommodate a thousand additional patients each year in the same number of beds. Yet continued growth in patient volume will inevitably require ever-evolving solutions.

Indeed, the focus is not just on finding better ways to bring more patients to Roanoke Memorial, but also on directing patients, where possible, to other hospitals and clinics within the system.

Among the latest developments is a remote telemetry center, located just upstairs from the CTaC, that will soon be capable of monitoring at-risk patients at a central location.


"For some patients, usually elderly, who are at risk of falling, we need to have people making sure they're staying in the bed, staying safe," Morris says. From the centralized location, tech workers acting as "virtual sitters" can keep track of up to 12 patients each—freeing busy floor nurses for other tasks.

## Behind the Curtain

Those patients will likely have only the most tangential knowledge of all the personnel, technology, and planning being brought to bear to ensure their safety. So, indeed, will the stroke patient and her grateful family.

Using interventional radiology techniques unavailable even five years ago, the team at the Carilion Stroke Center removes the woman's clot, and she is out of danger, with an excellent chance of full recovery. The nurse who fielded the original call has alerted the intensive care unit, to make sure a bed is open and waiting so the woman can receive the postprocedural care she'll need.

For CTaC, Morris says, staying "behind the curtain" is part of the design.

"Patients don't need to worry about what we look like or what we're doing," she says. "They and their families just need it to feel right, and to know that they're getting the care they need when they need it." 



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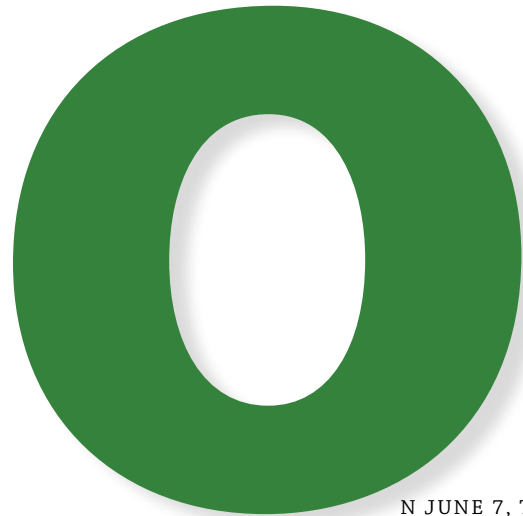
# Roanoke

One orthopaedic surgeon's Ironman journey has taken him around the world—and then home again. **BY MARCIA LERNER**



**WARM UP:** Dr. Thomas K. Miller takes his morning run on Mill Mountain, home to Roanoke's iconic star. The Ironman 70.3 that will be held in Roanoke in June will include 13.1 miles of running along the Roanoke River Greenway.





ON JUNE 7, THE ROANOKE community will for the first time host an Ironman 70.3, which features a daunting 1.2 mile swim, a 56-mile bike ride, and 13.1 miles of running. Those 70.3 miles—where the event gets its name—are roughly half of what is involved in the original Ironman, which has a 2.4 mile swim, a 112-mile bike ride, and a full 26.2-mile marathon.

With such grueling distances and different skills involved, how does anyone find the time, energy, and inspiration to compete? In particular, how could one overworked, exhausted surgical resident who was on call every third night even consider participating?

Just ask Thomas K. Miller, M.D. Now vice chair of the Department of Orthopaedic Surgery and chief of Sports Medicine at Carilion Clinic, Dr. Miller was a surgical resident when an attending surgeon opined that anyone who did a triathlon had to be out of his mind. That sounded like a challenge to Dr. Miller, who did his first triathlon in 1983 when he was in the second year of his orthopaedics residency.

Since then, as his medical career has unfolded, Dr. Miller has continued to explore triathlons. Both pursuits have changed him—at the same time he has made an impact on them.

## The Racing

Dr. Miller, whom friends call T.K., earned his medical degree at the University of Pittsburgh, followed by training in general surgery and orthopaedics. From Pittsburgh he went to Columbus, Georgia, for a sports medicine fellowship. An athlete in high school and college, Dr. Miller let that part of his life lapse in the summer between college and medical school.

“I did construction work and got big and fat,” he says. But then in medical school he began running again, and he swam during a break between classes. He bought a bike to commute to the hospital during his general surgery residency—and without quite knowing it, he was preparing for a triathlon.

When Dr. Miller visited Roanoke in 1986 to interview for a position at the Roanoke Orthopaedic Center, he was hoping to find a place with good cycling. He was immediately struck by the beauty of the city and the surrounding area. Roanoke welcomed him, both professionally and athletically. While working as part of the orthopaedic service at Roanoke Memorial Hospital, he qualified for

national finals in the triathlon three times, culminating in participation in the full Ironman in Kona, Hawaii, in 1996.

At that point, Dr. Miller says, he began to feel he had done everything he wanted to do with triathlons. But that didn’t mean triathlons were done with him.

## A Growing Connection

Even as Dr. Miller was honing his biking, swimming, and running skills, he became involved with triathlons as a doctor as well. In 1989 he answered a medical journal ad for a position with the U.S. triathlon team. He became a physician for Team USA in 1989, and went on to serve as medical director for USA Triathlon for the next 15 years, all of it as a volunteer.

That work led to connections at the Ironman organization, where he has also volunteered for medical posts, and in 2015 he was named Ironman’s chief physician. The following year, he was asked to take over as chair of the Ironman Global Medical Advisory Board. In 2020, he will serve as medical director of the Ironman 70.3 in Honu, Hawaii, in May, just one week before Roanoke’s race.

For Dr. Miller, the intertwining of these passions—medicine and triathlons—has been incredibly satisfying and productive. Serving on the Ironman advisory board offers him a wealth of experts from varied fields—orthopaedic surgery and cardiology as well as data protection and security—to connect with on medical questions.

“The triathlon has given me exposure to other sports medicine providers, whether it’s to talk about injury patterns or just to connect in person,” he says. “There is an orthopaedic surgeon from California I see every year, and we talk about what has changed in rotator cuff and shoulder surgery.” Sometimes, Dr. Miller learns about advances in sports medicine through his Ironman connections before they show up in publications.



**GOOD SPORT:** Dr. Thomas K. Miller intertwined his passion for sports and medicine by competing in triathlons as well as serving as physician for a host of athletic organizations.

## Taking Off as a Doctor and an Athlete

Part of the thrill for Dr. Miller has been to watch both medicine and triathlon racing develop. “I almost pre-date arthroscopy,” he says of his early days at Carilion, and he entered the world of triathlons just as the sport was gaining a foothold in the American imagination.

San Diego hosted the first modern triathlon in 1975, and the first Ironman in 1978 was staged in Hawaii, just five years before Dr. Miller raced in his first triathlon. He has watched Carilion’s Department of Orthopaedics grow at the same time that the Ironman expanded from its first race, with just 15 participants, to include more than 190 events with roughly 2,500 people competing in each 70.3-mile race and up to 3,000 in each full-distance Ironman event. And increasing numbers in both fields have been accompanied by great advances in sports medicine and orthopaedics.

“How far orthopaedics has come from when I joined Carilion to now is pretty remarkable,” says Dr. Miller. “And to have been a small part of that has been a privilege.”

## Lessons Learned

Dr. Miller, now 65, continues to seek out both medical and athletic challenges. As a doctor, he says, thinking about the potential harm to Ironman participants can be daunting.

“I am almost terrified of going out to Hawaii every year because of the laundry list of bad things that can happen,” he says. “We have athletes push the absolute edge of their performance envelope and can end up really, really sick.”

Once on the Big Island, though, Dr. Miller knows he will connect there with people who likely know more about how to care for these competitors than anyone else. “It’s always reassuring to know some of the world’s best are part of our medical staff,” he says, “and it’s been a privilege to work with these experts.”

Meanwhile, after some time off, he has been doing open-water swims. But these days, he participates in races for pleasure rather than to compete.

And for all of the joy the Ironman has given him, he has rarely been there to see exhausted, exultant participants cross the finish line. The one time he was there as a spectator, he was able to witness the oldest man ever to finish a triathlon—an 86-year-old—cross the line ahead of competitors who were decades younger. It’s a sight that stays with him.

So when the 70.3 comes to Roanoke this spring, you might see Dr. Miller at the finish line—one way or another. Family members are coming in from Pennsylvania, South Carolina, and Colorado to participate. Would he join them in competition?

“Ask me later,” he laughed. “The first triathlon of any consequence I ever did was in Roanoke. If I were to do one again, it could be pretty neat to do it here.” **CM**

# how roanoke got in the running



Bringing the Ironman to Roanoke took its own Herculean effort—and several legs to the journey.

A major player was John R. Clements, D.P.M., co-chair of foot and ankle at Carilion Clinic. Dr. Clements, who goes by Randy, started training for triathlons in 2016 to get more fit, running his first one in 2017. He loved it, and worked up to participating in an Ironman in Raleigh, North Carolina. When Raleigh stopped hosting that race in 2018, Dr. Clements thought about how great his hometown would be as a replacement. He asked Ironman for an application.

“The application was really long,” he laughs, guessing that it was designed to discourage those who weren’t serious. Dr. Clements not only completed it but also followed up, pressing ahead until, with the support of elected officials, community members, and the beauty of the city itself, Roanoke was chosen for the event.

Now Dr. Clements is busy preparing for the race and encouraging others in the

community to take part. He’s thrilled that locating the race in Roanoke, in the heart of Carilion’s medical community, will result in an Ironman first—having every stop on the race staffed with physicians. He encouraged fellow runner Sarah Klemencic, M.D., an emergency medicine doctor at Carilion who has run several half-marathons, to take on the challenge of managing the volunteers for Roanoke’s event—all 2,000 of them.

How do the two doctors balance their medical practices and their athletic endeavors, not to mention their family (and Ironman!) responsibilities? They agree on the secret: “Enjoy it,” Dr. Clements says, noting that missing a few training sessions is no cause for panic. “The important thing is to do it because you want to do it, not to have it become an obligation.”

Dr. Klemencic concurs, adding, “Training actually makes it easier to do more, because you feel stronger and more engaged, calmer and more flexible. It’s a great way to manage the stress of work.”

For both of them, a big part of the thrill of the upcoming Ironman is in welcoming people to Roanoke.

“I’m looking forward to the Ironman not just as a sporting event or a Roanoke event,” Dr. Clements says, “but as a community event.”





**GOING GREEN:** Trained as a nurse, Sara Wohlford found her true calling in leading Carilion's sustainability program.

The Carilion Clinic community is on a collective journey to reduce waste and make the health care system more sustainable. BY VERONICA MEADE KELLY

# trimming the

# Waste line



LIKE OTHERS OF HER GENERATION, Sara Wohlford, R.N., M.P.H., grew up internalizing the “reduce, reuse, recycle” mantras guiding people to be more environmentally responsible.

That’s why, when she started working as a nurse in the Emergency Department at Carilion Roanoke Memorial Hospital in the early 2000s, certain practices didn’t feel right. Pounds of unused supplies were thrown away daily. Lights were left on around the clock, and the hospital didn’t have the recycling programs she would have expected.

Wohlford soon realized that she wanted to make it her life’s work to bring more environmentally friendly practices to Carilion Clinic. Yet it was hard to know where to start. At the time, only the largest health systems seemed to have the resources to address the issue, so there were few models to follow, and she wasn’t aware of degree programs that might train her for such a career. Like others at Carilion and in the health care field more broadly, if Wohlford wanted to leave less of a footprint, she would, ironically, have to blaze a trail.

Over the next decade and a half, Wohlford and her colleagues would do just that, forging a sustainability program that would, in a relatively short time, decrease medical supply and food waste by tens of thousands of pounds per year, and drastically reduce water and energy usage.

It’s a journey that’s put Carilion on the cutting edge of a growing movement in health care.

## An Exceptional Challenge

Carilion isn’t alone in struggling with this sustainability crisis. According to Practice Greenhealth, an organization that advises the health care community on sustainability, hospitals are second only to food service among commercial energy users, producing roughly 8 percent of the country’s greenhouse gas emissions. Hospitals also generate more than 4.67 million tons of waste every year and use 7 percent of the country’s commercial water supply.

While some of these inefficiencies are an expected byproduct of volume—nearly 38,000 inpatients and an estimated 113,000 visitors pass through Roanoke Memorial’s doors each year—others can be traced to inescapable challenges peculiar to the health care industry. Many of these revolve around patient safety.

“We have many regulations we must match or exceed when we’re taking care of patients, because their well-being is our top priority,” Wohlford explains. “For example, any new recycling container has to be approved by life safety experts to make sure it meets fire code standards. It also has to be run by infection control because certain materials, like corrugated cardboard,

can collect bacteria or dust mites—things that we absolutely cannot have here. So, when we introduce new programs, everything is a bit more complicated.”

Nevertheless, to Wohlford and a growing number of health care professionals, sustainability is an effort worth investing in, especially considering the impact of environmental factors on community health.

It was that connection that led Wohlford to enroll in a master’s program in public health at Virginia Tech. Concurrently, she started to work with Virginia Tech faculty and Carilion leaders to draft a business plan for sustainability, relying on advocacy organizations such as Practice Greenhealth and Health Care Without Harm for guidance in what were relatively uncharted waters.

As she did, it became clear to all involved that running and advocating for any of the proposed programs would be a full-time job. Working with her boss, Vice President of Emergency Services and Care Management Paul Davenport, R.N., M.B.A., and other Carilion leaders, Wohlford drafted the sustainability manager position, a role she would formally move into in 2015.

## Waste Watchers

Coming out of the gate, Wohlford and her advisors prioritized projects that were achievable and financially sound. They started recycling programs that emphasized reuse and donation, for instance. Five years later, Carilion boasts a single-stream recycling initiative that has cut the waste destined for landfills by 97,000 pounds per year. Carilion has also donated more than 53 tons of excess medical supplies to support medical education and international missions.

Another early success involved a retrofit of light bulbs at Roanoke Memorial. The project, which was completed last year, saw more than 30,000 bulbs replaced by LEDs, an effort that has cut the energy used for lighting in half.

Meanwhile, several other programs made their way to various stages of the project pipeline as teams across the health system worked with the sustainability team to build strategies and business cases for implementation.

The consistent thread through all of these efforts has been the commitment of employees to see them through. The success of the programs has relied not just on the sustainability team, but on the oversight of an Environmental Stewardship Council composed of executives and other leaders who offer guidance on the feasibility of individual programs, as well as the commitment of department heads willing to partner on sustainability. Perhaps most important are the thousands of nurses and clinicians who do much of the legwork, ensuring that the reforms are put into action systemwide.

For this, Carilion relies heavily on sustainability champions—roughly a hundred volunteers from



**While many hospitals opt for disposable bed pads, gowns, and other linens for the sake of convenience, Carilion Roanoke Memorial Hospital has committed to reusing every product that can be reasonably laundered.**





**TRAY MONITOR:** Efficiency and sustainability fellow Adeola Adeoye spent weeks observing patients' eating habits and found that milk and salads were the items most often wasted.

departments throughout the system who help educate colleagues and oversee the execution of new initiatives.

"I can put down recycling containers all day long," Wohlford says, "but if the thousands of employees we have don't know what belongs in each one, it's all for naught."

Sustainability champions not only relay objectives and logistics; they also receive updates to share with their teams about how much waste they've reduced and when sustainability milestones are hit. Meg Scheffel, R.N., M.B.A., vice president and chief nursing officer at Carilion, believes the feedback they provide to and from the sustainability office helps nurses and other health care workers appreciate the upside of their efforts.

"From an engagement perspective," she says, "it helps nurses relate the sustainability programs to our overall mission of providing quality care."

Part of that care is stewardship, Scheffel adds. Clinicians and nurses have a responsibility to use resources wisely. In addition to recycling, the sustainability champions have encouraged nurses to be more mindful of supplies taken into patients' rooms. When rooms aren't overstocked, fewer supplies have to be discarded and fewer new items need to be stocked.

Carilion also reduced supply waste by working with infectious disease experts to develop policies on restocking and donating unused items. It was determined that in many cases, if items hadn't been opened and weren't visibly soiled, they could be reused.

"Supply return has been huge," Scheffel says, noting that it's saved \$61,000 in less than a year. "And it's something nurses can relate to, understand, and control. There's a lot of momentum out there to support our environment and keep things out of the landfill."

## Leaning Green

Food waste has been another key target for sustainability, and it's another area in which teamwork made progress possible.

Pat Bird, senior director of dining and nutrition services, joined Carilion just as the sustainability office was formally

getting off the ground. It was fortuitous timing, as Bird's department was looking to cut costs, and food waste pointed to possible inefficiencies. The timing was good on another front: Bird's area had just partnered with the sustainability department to take on Adeola Adeoye, an efficiency and sustainability fellow with the time and drive to focus on the problem.

Adeoye spent her first few months at Carilion researching what other health care systems were doing about food waste.

"Then we really needed to look at our patient menu, to understand what our patients actually wanted to eat," Bird says. It was no small task given the variable duration of hospital stays, the nutritional needs of patients, and the logistics of serving patients, visitors, and employees.

For weeks, Adeoye monitored patient eating habits, measuring and tracking food that returned from patient areas. One pattern of waste that she uncovered was the volume of milk cartons and salads that came back untouched. Both items were served with meals as a matter of course, yet as much as 20 percent went to waste.

Based on this and other observations, Bird's team experimented with the menu, and milk and salad became optional items that patients could order. The team then further refined their menu using the feedback and data that Adeoye collected. Since adopting the new menu systemwide, Carilion has reduced food waste by tens of thousands of pounds and saved tens of thousands of dollars per year. A similar approach has resulted in savings on the public-facing, cafeteria side of Carilion's food services as well.

Additionally, Dining and Nutrition Services has started to convert from plastic and Styrofoam to more eco-friendly tableware.

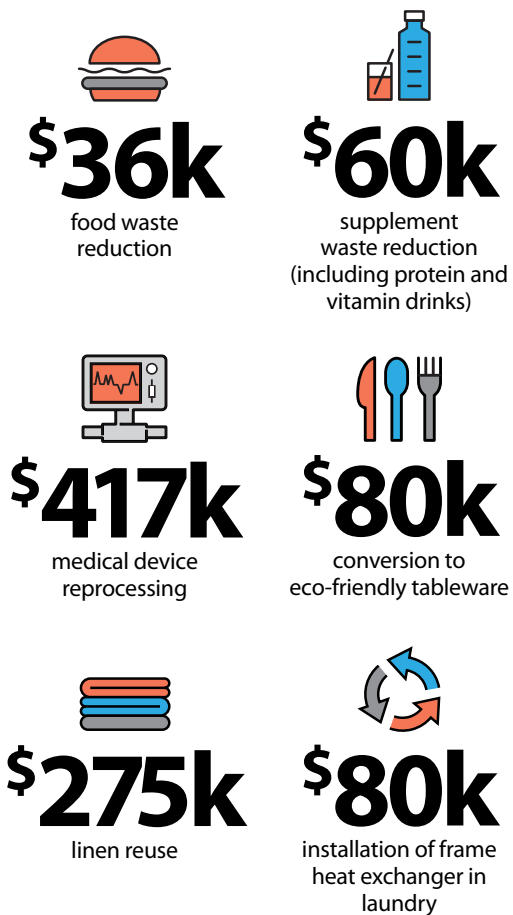
"We've converted more than 40 percent of our Styrofoam products," Bird says. "The added expense of the new products has slowed our progress, and yet I think eventually they'll be entirely eco-friendly."

Bird is also excited about Carilion Cuisine, a new frozen-meal program that will benefit patients off-hours, in the Emergency Department, and in various clinics. The line—which will offer its own food jackets with nutritional information and cooking instructions—will provide more flexibility in feeding patients that should result in less waste.

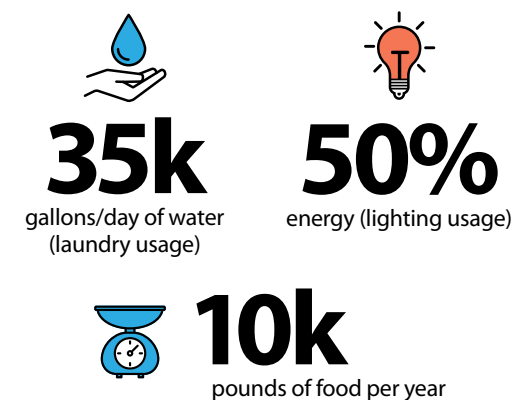
## Dropping Disposables

Carilion's laundry services has also found ways to cut waste, drastically reducing water usage and supply costs over the past four years. In addition to tuning up equipment and tightening pipes to prevent leaks, the department has invested in a new tunnel washer and three new pony washers. The machines, which

### Carilion's estimated savings since 2016 \*



### Resources saved



\* does not reflect the cost of implementing programs

were installed in April 2019, have helped reduce water usage by roughly 35,000 gallons a day.

And that's not because the machines are washing less. In fact, while many hospitals opt for disposable bed pads, gowns, and other linens for the sake of convenience, Roanoke Memorial has committed to reusing every product that can be reasonably laundered. This is even true for operating room linen.

"I have five kids. We used disposable diapers, so I understand it. It's a lot more convenient than laundering diapers," says Jim Buchbinder, head of laundry services. "In a hospital setting, it's easier just to throw away all the mess that's created—just put it into a plastic bag and send it to a landfill. It's harder to wash it, but it's definitely something we have the technology to do, and it benefits the environment and the hospital for us to do it."

Carilion's efforts have seen linen expenditures drop by \$275,000 year over year, which has helped offset the investment in new machines. But the potential savings aren't the main reason Buchbinder feels strongly about the initiatives.

"Many hospitals have opted for convenience maybe even despite the cost, but Carilion is committed not to do that," he says. "I'm proud that I work for an organization that stands for that."

## Looking to the Future

As the climate discussion has taken on more urgency, Wohlford has seen it reflected at work.

"More and more, physicians and nurses are coming to the sustainability team and asking, 'where do we sit with this?' I want to figure out how we can help with climate solutions through the lens of health, because the links are real," she says, citing the connection between air quality and health and the dangers that come with weather emergencies, just to name a few.

With that in mind, Wohlford's team organized Carilion's first Climate and Health Conference in October. The event brought clinicians, nurses, and other health care professionals from across Virginia to discuss what health providers can do to educate the public, as well as patients and each other, about the impact of climate on health. It's part of an ongoing conversation that will continue to unfold in the coming years.

That discussion is sure to add to the growing list of initiatives Carilion is considering. Yet the fact that the journey is incomplete shouldn't detract from the progress already achieved.

"If you look back on where we were four years ago and where we are now, we've made tremendous strides on sustainability," Bird says. "We're not totally there yet, but we are on the cusp of greatness. We're almost there."

[CarilionClinic.org/carilionmedicine](http://CarilionClinic.org/carilionmedicine)





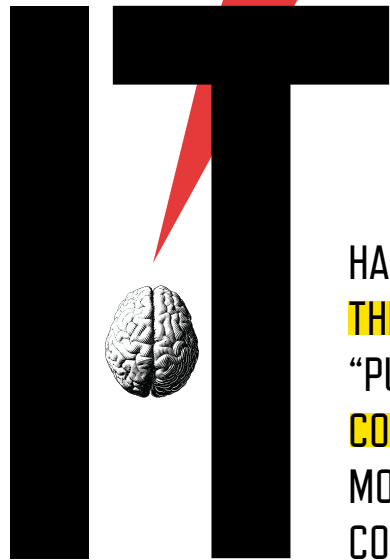
# THE GAME

By John Pastor

## CHANGER

A TEAM OF SCIENTISTS DEvised A NEW MOLECULAR TEST FOR MILD TRAUMATIC BRAIN INJURIES THAT THE U.S. FOOD AND DRUG ADMINISTRATION HAS DEEMED A BREAKTHROUGH.





HAPPENS ALL THE TIME IN SPORTS—SOMEONE RECEIVES **A BLOW TO THE HEAD** DURING A GAME AND ASSURES TEAM TRAINERS ALL IS WELL: “PUT ME BACK IN, COACH.” EXCEPT THE PLAYER MAY HAVE SUFFERED A **CONCUSSION**, ALSO KNOWN AS A **MILD TRAUMATIC BRAIN INJURY**. MOST PEOPLE SPONTANEOUSLY RECOVER, BUT ABOUT 15 PERCENT CONTINUE TO HAVE **POST-CONCUSSIVE SYMPTOMS** MORE THAN A YEAR

after their injury—symptoms that may not have even been present when the injury occurred.

“Caregivers see a seemingly innocuous injury on the soccer field, and the player winds up suffering from headaches and failing out of school,” says Damon Kuehl, M.D., an emergency medicine physician at Carilion Clinic and an associate professor at the Virginia Tech Carilion School of Medicine. “Yet someone who may have been knocked completely unconscious gets up, and an hour later is seemingly fine and has no ill effects—ever.”

“The way I describe it is providers need a proverbial crystal ball to deliver quicker, more definitive diagnoses so we can get patients the care they need more quickly,” Dr. Kuehl adds. “The problem is we don’t have great tools right now for diagnosing mild traumatic brain injuries at the initial point of care.”

It’s the concussion conundrum—how do you diagnose an injury that often has no signs or symptoms? It could be that the solution is small enough to fit in your pocket.

## GAME PLAN

Work started in 2018 when Virginia Tech scientists—including principal investigators Michael Friedlander, Ph.D., executive director of the Fralin Biomedical Research Institute at VTC, and Stephen LaConte, Ph.D., an associate professor at the institute—won a \$500,000 competitive grant to speed the development of a multi-modality system to aid in the diagnosis and management of mild traumatic brain injury.

The effort involved BRAINBox Solutions, an early-stage startup biotech company that was developing a multi-modality concussion test to administer directly at the point of care.

“While our research was under way, the U.S. Food and Drug Administration granted ‘Breakthrough Device’ designation for the new diagnostic approach from BRAINBox Solutions,” says Dr. Friedlander, who also serves as Virginia Tech’s vice president for health sciences and technology. “The FDA recognized how important it was to accelerate this effort and to be able to accurately and rapidly diagnose mild traumatic brain injury in patients, especially those at greatest risk, including young people, athletes, soldiers, and the elderly.”

The device uses a biochemical test called an immunoassay that measures the presence of molecules in a solution. A small patient blood sample

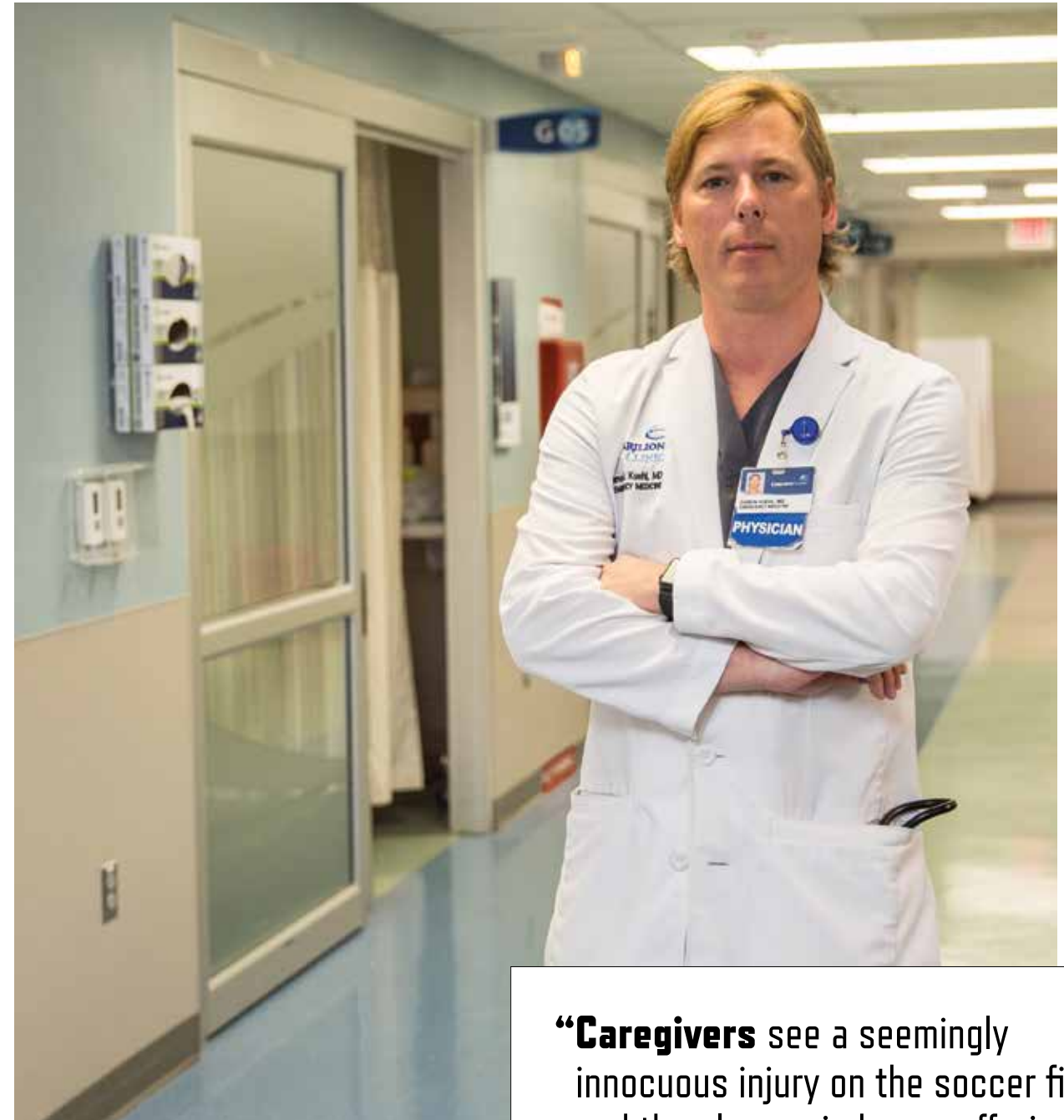
is placed in a container not much larger than a USB drive. The test hunts for specific proteins that have leaked from injury-damaged cells in the brain, entered cerebrospinal fluid, and from there crossed the blood-brain barrier.

The proteins serve as biomarkers that can be measured at the point of care through an artificial intelligence-driven algorithm that integrates data from all the test’s components, which also includes validated neuropsychiatric testing. Cognitive assessments are included as well to determine the result of the biological and functional impact of the injury.

“This is a game changer,” says Donna Edmonds, a former critical care nurse and chief executive officer of BRAINBox Solutions. “The brain is extremely complex, and to understand what is going on during a head injury, it takes a multi-biomarker, multi-modality approach. Our method includes a test using a sample of whole blood placed on a cartridge or analyzed in a hospital-based laboratory. The point-of-care test will be plugged into a handheld device, and within about 30 minutes, you have a result.”

As part of a specific site sub-study, Dr. LaConte is deploying sophisticated structural and functional brain imaging technologies on patient volunteers in conjunction with Dr. Kuehl’s clinical assessments and venous blood draws to evaluate BRAINBox’s blood-based biomarker assay.

The objective of the research is to determine whether BRAINBox Solutions’



**“Caregivers** see a seemingly innocuous injury on the soccer field, and the player winds up suffering from headaches and failing out of school.”

—Dr. Damon Kuehl





### HOW MANY FINGERS AM I HOLDING UP?

If the answer to the question is close to the mark—as it always is—the injured party jumps back into the fray.

test is as accurate as clinical assessments and to demonstrate when to use magnetic resonance imaging.

“Ultimately, the goal is to reveal what the brain is doing functionally in the context of results from neurocognitive and behavioral testing,” Dr. Friedlander says. “The profile of blood-borne biomarkers in combination with functional testing that reflect the injury and restoration processes under way in the brain provides a very promising approach to the process in its earliest stages, before the later manifestations occur at the level of behavior and cognition.

“When integrated with a battery of neuropsychological tests and through standardization across multiple sites,” Dr. Friedlander adds, “this approach offers an exciting new opportunity for the development of a true point-of-care objective assessment for diagnosing mild traumatic brain injury and providing a scientifically valid approach for personalized care for the patient.”

## A HEALTH PROBLEM FOR ALL AGES

Just about everyone knows the Hollywood version of the concussion test. Someone gets cracked in the head and a helpful friend rushes to that person’s side, anxiously asking, “How many fingers am I holding up?”

If the answer to the question is close to the mark—as it always is—the injured party jumps back into the fray.

In real life, the script is not that much different. People really are eager to get back into the game, or to school or work. After all, “mild traumatic brain injury” suggests the injury is, indeed, mild. Right?



**“The FDA recognized how important it was to accelerate this effort and to be able to accurately and rapidly diagnose mild traumatic brain injury in patients.”**

—Dr. Michael Friedlander

Not always. The potential side effects of concussions can be life-changing. The Centers for Disease Control and Prevention has concluded that concussions can affect memory, reasoning, sight, communication, and understanding. And multiple mild traumatic brain injuries have been linked to a range of mental health issues, including depression, anxiety, personality changes, and aggression.

As a clinical condition, concussion has been recognized for more than 2,000 years, dating back to Hippocrates, who watched classical wrestlers lose their senses after receiving head blows. The father of modern medicine concluded that “no head injury is too trivial to ignore.”

The warning was visionary, but not necessarily heeded. And as a research subject, concussion hasn’t kept pace.

In the 16th century, physicians coined the term *commotio cerebri*, referring to the shaking of the brain to describe the loss of mental function that concussion can cause.

The development of the microscope in the 17th century allowed scientists to reveal the differences in brain tissue of deceased patients who have had concussions compared with those who have had severe brain trauma.

More recently, concussion research was thrust into the limelight because

**“The idea that a traumatic brain injury could be mild is misleading because these injuries have multiple downstream effects on a person’s behavior and day-to-day functioning.”**

—Dr. Stephen LaConte

of the tragic story of Mike Webster, a National Football League Hall-of-Famer who retired with symptoms of amnesia, depression, and dementia. He became homeless and separated from his family.

After his death, he was examined and diagnosed with a neurodegenerative disease called chronic traumatic encephalopathy. Doctors concluded that Webster’s frontal lobe had been damaged by multiple mild traumatic brain injuries during his career.

Edmonds points to a 2017 study published in the *Journal of the American Medical Association* that found that chronic traumatic encephalopathy, known as CTE, was found in 99 percent of deceased National Football League players’ brains that were donated to scientific research.

## SAFETY FIRST

Today, qualified health care professionals make the final call before injured players return to the field, and they use a guide derived from the Sport Concussion Assessment Tool 2, a standardized method of evaluating injured athletes for concussion that accounts for symptoms, physical signs, cognitive assessment, and memory tests.

The assessment tool is far more sophisticated than the how-many-fingers



test from the movies, but it’s not quite at the level of searching for molecular biomarkers of brain injury, either.

The important thing to remember is “safety first,” Dr. Kuehl says.

“When someone hits their head, we are really focused on what will happen to that person in the future,” Dr. Kuehl adds. “A big portion of our study is not only to diagnose a concussion accurately at the time it occurs, but also to have a predictive component to better figure out who’s going to comparatively suffer more from the injury and who will need more intensive treatment.”

An estimated 1.5 million to 2 million new mild traumatic brain injuries occur each year, mostly because of falls and auto accidents. Those numbers may underestimate the injury’s incidence, as not everyone with a head injury seeks medical attention.

“The idea that a traumatic brain injury could be mild is misleading because these injuries have multiple downstream effects on a person’s behavior and day-to-day functioning, especially if the diagnosis isn’t made,” Dr. LaConte says. “We’re taking all of the tools we have available to understand the neurobiology of brain trauma and brain recovery. Developing this technology could really revolutionize approaches to this medical challenge, which affects people across all age groups.”

Since the mild traumatic brain injury study began, it has grown into a multi-center study with as many as 18 sites expected to enroll patients. All data analysis is expected to be completed by the end of 2021.

“This research,” Dr. Friedlander says, “represents a collaboration of creative scientists and physicians who are committed to the power of large-scale, rigorous scientific testing to advance the diagnosis of mild traumatic brain injury.”



# All Our SUITS Wear COATS

Carilion Clinic executives retain their clinical practices—and white coats—to ensure their administrative focus never strays from patient care.

— ... —  
PHOTOS BY JARED LADIA



## Cut from the Same Cloth

Tracey Criss, M.D., Vice President, Medical Staff Affairs, Carilion Clinic; and Associate Dean for Clinical Science Years 3 and 4, Virginia Tech Carilion School of Medicine

**HOMETOWN:** Roanoke, Virginia  
**CLINICAL SPECIALTY:** Psychiatry  
**WHY I DO WHAT I DO:** Medicine allows me to provide care and comfort.  
**PERSONAL PHILOSOPHY:** Life is like a square, and all sides of that square—physical, mental, spiritual, and emotional—must be in balance.

**BEST PART OF CLINICAL WORK:** Caring for patients and watching them transition from the depths of depression to happy lives.  
**NEXT AUDACIOUS GOAL:** To learn to play golf—not necessarily to be good, but to know I'll hit the ball every time I swing!  
**WHAT MY WHITE COAT SIGNIFIES:** I wear my white coat all day at work, whether I'm

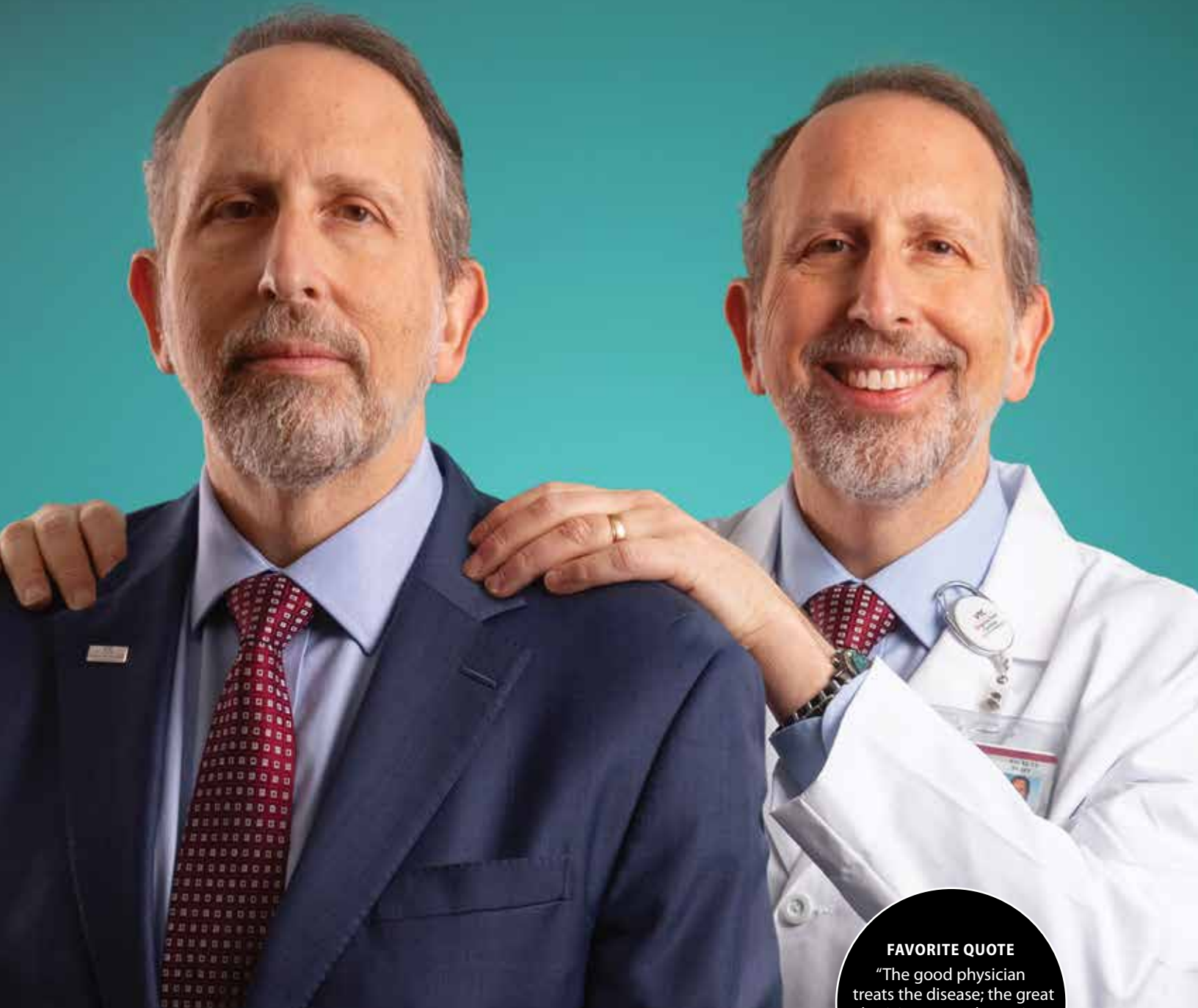
seeing patients or performing administrative duties. It's just ingrained in me; it identifies me as a physician and symbolizes my responsibility for providing care and comfort to others. I can't imagine being at work and *not* wearing my white coat. It would be like trying to drive a car without first shutting the door.

### FAVORITE QUOTE

"It's not what you look at that matters, it's what you see."

—Henry David Thoreau





## Like Looking in a Mirror

Lee Learman, M.D., Ph.D., Dean, Virginia Tech Carilion School of Medicine

**HOMETOWN:** Los Angeles, California

**CLINICAL SPECIALTY:** Obstetrics and gynecology

**WHY I DO WHAT I DO:** Our medical students will make an impact throughout their careers. For some, it will be one patient at a time; others will combine patient care with teaching, research, and community service.

**NEXT AUDACIOUS GOAL:** To lead the process of transforming the Virginia Tech Carilion School of Medicine from one of the best new medical schools to one of the best U.S. medical schools, period

**FAVORITE PLACES ON EARTH:** Yellowstone, Grand Tetons, Zion, Bryce, and Yosemite national parks—and the Galapagos Islands

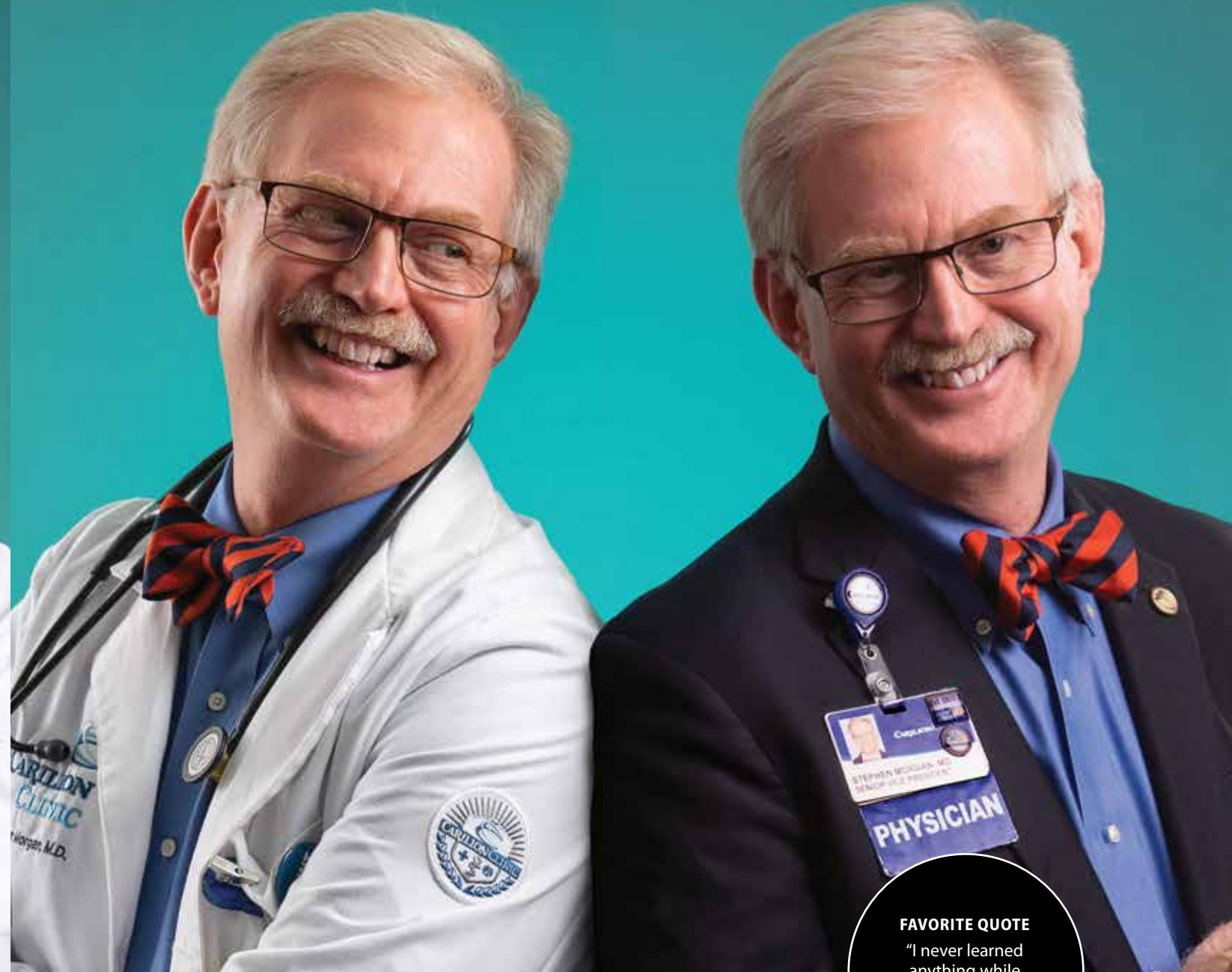
**SURPRISING PERSONAL DETAIL:** I've sung in choirs since high school. In medical school, a few of us founded the "Testostertones"; I now sing with the Roanoke Symphony Chorus.

**WHAT MY WHITE COAT SIGNIFIES:** My white coat symbolizes a sacred trust between doctor and patient. It defines my role as compassionate healer, listener, and confidante.

### FAVORITE QUOTE

"The good physician treats the disease; the great physician treats the patient who has the disease."

—William Osler



## Dynamic Duo

Stephen Morgan, M.D., Senior Vice President and Chief Medical Information Officer, Carilion Clinic

**HOMETOWN:** Woodstock, Virginia

**CLINICAL SPECIALTY:** Family medicine

**WHY I DO WHAT I DO:** I have the privilege of helping clinicians and providers improve how they deliver care by providing actionable data at the point of care and developing efficient ways to document their work in the electronic health record. This work is

an extension of why I entered medicine—to help take care of patients and their families.

**NEXT AUDACIOUS GOAL:** To transform Carilion's electronic health record into a more user-friendly and efficient tool that can deliver insight and guidance to our providers

**FAVORITE PLACE ON EARTH:** A quiet trout stream in Fort Valley, Virginia

### FAVORITE QUOTE

"I never learned anything while I was talking."

—Larry King

**PERSONAL PHILOSOPHY:** Never ask anyone to do something that you would not do.

**WHAT MY WHITE COAT SIGNIFIES:** It's easy, as chief medical information officer, to get caught up in technological and administrative challenges. Yet seeing patients while wearing my white coat reminds me of why I love caring for them.





## Two in One

Patrice M. Weiss, M.D., Chief Medical Officer and Executive Vice President, Carilion Clinic

**HOMETOWN:** The Poconos, Pennsylvania  
**CLINICAL SPECIALTY:** Obstetrics and gynecology

**WHY I DO WHAT I DO:** Whether I'm practicing medicine while wearing my white coat or making administrative decisions, I know I'm touching lives and trying to improve our patients' health.

**WHY I CHOSE MEDICINE:** People are our greatest asset, and nothing fascinates me more than the human body. Medicine allows me to study what I love and to be with people at their best and most vulnerable times.

**SURPRISING PERSONAL DETAIL:** I love malls.  
**NEXT AUDACIOUS GOAL:** To help define the next generation of an academic health center

**PERSONAL PHILOSOPHY:** Everybody is somebody!

**FAVORITE PLACE ON EARTH:** The fitness facilities of Carilion Wellness

**WHAT MY WHITE COAT SIGNIFIES:** I'm always reminded that it's about the patient first and that I have the greatest privilege and responsibility—to be entrusted with someone's health.

### FAVORITE QUOTE

"I've learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel."

—Maya Angelou



## Double Exposure

Donald Kees, M.D., Designated Institutional Officer for Graduate Medical Education, Carilion Clinic

**HOMETOWN:** Martinsburg, West Virginia  
**CLINICAL SPECIALTY:** Pediatrics

**BEST ASPECT OF CLINICAL WORK:** I thoroughly enjoy teaching medical students and residents, and I especially love to see them applying the principles of pediatrics I've taught them. I also relish being able to see children who have been

very ill recover and return to being normal, active kids again.

**GREATEST CHALLENGE OF CLINICAL WORK:** Medicine is ever changing, and things I once knew with certainty I now question. Even the names of some bacteria have changed!  
**NEXT AUDACIOUS GOAL:** This spring, I'll attend a six-hour-a-day, three-day camp

at Winter Park Ski Resort in Colorado to improve my mogul skiing skills.

**WHAT MY WHITE COAT SIGNIFIES:** Donning my white coat is a symbol of taking on the mantle of being a physician. In the hospital, pediatric patients encounter many care providers; wearing my coat helps them understand what role I'm playing in their care.

### FAVORITE QUOTE

"I find that the harder I work, the more luck I seem to have."

—Thomas Jefferson



# GAP

*filling the*

As physician advisor, Dr. Bruce Long works to streamline more complex clinical cases.

BY TIFFANY HOLLAND | PHOTOS BY JARED LADIA

ONE WAY TO GET A TOUR OF CARILION CLINIC OPERATIONS WOULD be to follow Bruce Long, M.D., around on a typical weekday.


In his new role as physician advisor, Dr. Long serves across various Carilion facilities, working as a liaison to tie together many of the pieces that make health care whole. He and a team of five physicians work with clinicians and administrators to find innovative ways to ensure compliance and accuracy for documenting reimbursement-related services.

"I view health care holistically," he says. "My job is to help find the final pieces of the puzzle in delivering the best care to every patient. I look at the long game and try to help from the outside."

On any given day, Dr. Long can be found jumping from meetings with a complex care team in a satellite office to consulting with social workers in the Emergency Department of Carilion Roanoke Memorial Hospital. In between, he maintains regular clinical hours with some of his long-term patients.

During his many years as a surgical oncologist, Dr. Long has developed a deep knowledge of hospital systems and processes. He understands many of the obstacles his clinical peers encounter, and he's ready to lend a hand, whether it's to assess the medical necessity of services or to arrange resources for patients with complex needs. He streamlines more challenging clinical cases, to allow other providers to focus on care.

Dr. Long is also an effective patient advocate. As a cancer survivor, he empathizes with the confusion and fear many patients face in the hospital.

"Navigating the health care system can be hard," he says. "I have to come up with new, out-of-the-box ideas for care. If I can do something to help ease people's suffering, then that's what makes me happy in my work." 



#### TEAM PLAYER

Dr. Bruce Long consults with his fellow physicians at Carilion Roanoke Memorial Hospital. In his role as physician advisor, he collaborates with other providers, social workers, and administrators to find solutions to complex patient care challenges.





**DOCTOR ON THE GO**

A day for Dr. Bruce Long can mean visiting clinical sites, meeting with social workers, spending hours on the phone in search of patient resources, and seeing his own patients. Dr. Long, clockwise from top right, reviews clinical findings; examines a patient at an outpatient gastroenterology clinic; discusses treatment strategy with one of his longtime patients; accompanies the patient and his wife down the clinic hallway; and meets with a complex care team.



**GETTING THE DETAILS RIGHT**

Dr. Long takes a few moments to discuss the care of a hospital patient before meeting with social workers.



# ART FOR HEART'S SAKE

Carilion Clinic's annual Patient Art Show, part of a holistic approach to healing, warms up hospital atrium walls.

BY TIFFANY HOLLAND

**H**OSPITALS ARE FAMOUSLY STERILE ENVIRONMENTS. But they don't have to be. Four years ago, the Dr. Robert L.A. Keeley Healing Arts Program at Carilion Clinic joined forces with the National Arts Program to host an annual patient art show.

Each year since, the shows' creations have been displayed in the atrium of Carilion Roanoke Memorial Hospital, transforming it into an environment primed for human connection, meaning, and inspiration.

"The artwork says to anybody coming through the hospital doors that this is a place for healing," said Katie Biddle, director of the Healing Arts Program, which is funded by the Carilion Clinic Foundation.

Whether they've been hospitalized, visit a Carilion provider a few times a year, or simply receive annual checkups at Carilion, all patients are eligible to compete. Entry classifications include youth, teen, and adult amateur, intermediate, and professional. Awards worth more than \$4,000 are given out each year.

The most recent Patient Art Show featured more than 80 pieces of art. For many of the participating patients, their work is more than just a contest submission; it's part of a holistic healing process.

"Creativity is an important aspect of health and development across the lifespan," Biddle said. "It's a way to express our experience, whether joyful or not, and it helps us cope with challenges."

The Patient Art Show is sponsored by the National Arts Program, which partners with more than 90 venues across more than 30 states to create workplace exhibitions. Carilion, the first of those venues to host a patient show, also holds an annual Employee Art Show, making it the only National Arts Program partner to host two shows a year.

"These shows further the mission of the Healing Arts Program," Biddle said, "which is to integrate arts and creativity into the healing process." **CM**



A

## PATIENT ART SHOW 2019

**A.** Julie Riffey, Professional, "Little Church in Waits River, Vermont." **B.** Evelyn Anderson, Teen, "Tree Frog." **C.** Karen Pannabecker, Professional, "HAWWWWWW!" **D.** Angela Shields, Professional, "Aged to Perfection." **E.** Cheryl Lackey, Professional, "Still Standing." **F.** Angell Pasley, Professional, "Wrapping the Cat." **G.** Wanda Furrow, Amateur, "Up There." **H.** Jane Schafer, Professional, "Bright Days." **I.** Caroline Tate, Teen, "Reflections in the Wild."



B



C



D



E



F



G



H



I



# cheers for peers



## Emergency Medicine

**RANDY HOWELL, P.A.**, director of the advanced clinical practitioner fellowship in Emergency Medicine, presented at the national conference of the American Academy for Physician Assistants in Denver in May. There he gave a Wilderness Trauma lecture and led two Wilderness Medicine workshops.

## Family Medicine

**ROGER HOFFORD, M.D.**, medical director for Community Care/Transition Care, was part of the Complexity of Health Policy panel at the American Association for Physician Leadership annual meeting, which was held in May.

**STEPHEN MORGAN, M.D.**, chief medical information officer, participated in a panel on leveraging analytics to optimize electronic health records at the Healthcare Financial Management Association annual conference in June.

Dr. Morgan joined **PATRICE M. WEISS, M.D.**, chief medical officer and executive vice president, to present on the topic “The Evolving Relationship of the CMIO and CMO” at the Becker’s Hospital Review 5th Annual IT + Revenue Cycle conference in Chicago.

At this same conference, Dr. Morgan also participated in a panel titled “How Will Big Tech and Wall Street Impact Healthcare?” and Dr. Weiss participated in a

panel titled “The Biggest Problems and New Ideas in Health IT.”

## Internal Medicine

**GREGORY DEHMER, M.D.**, Cardiology, authored an invited editorial for *JAMA Cardiology* titled “Death to Mortality as a Reported Percutaneous Coronary Intervention Quality Metric.”

Dr. Dehmer also co-chaired a national meeting in Washington, D.C., titled “Addressing Dilemmas Related to Type 2 MI.”

**DANIEL F. PAULY, M.D., PH.D.**, Cardiology, spoke at the Missouri Primary Care Association’s annual meeting in Branson, Missouri. His topic was “Illicit Drugs: A Crisis of the Heart.”



**RAHUL SHARMA, M.D.**, Interventional Cardiology, was invited to be the guest chief medical editor

for the July-August edition of *Cardiac Interventions Today*. In the March-April edition, he published an invited review article on “Permanent Pacemaker After TAVR: Reviewing the Current Landscape.”

Dr. Sharma was also an invited faculty and speaker at the Society for Cardiovascular Angiography and Interventions 2019 National Conference in Las Vegas, where he spoke on “CAD and TAVR: To Stent or Not to Stent” and “Structural Heart Training: Are We Oversaturated?”



**PAUL SKOLNIK, M.D.**, chair of Medicine, is helping to lead Carilion’s involvement in the

Integrated Translational Health Research Institute of Virginia (ITHRIV), a translational research institute supported by a five-year, \$23 million Clinical Translational Science Award of the National Institutes of Health. Partnering institutions include Carilion, Virginia Tech, the University of Virginia, and Inova Health System.

The Carilion Interventional Cardiology program has been invited to join the Emory University Practical Interventional Course–Southeastern Consortium (EPIC-SEC), an academic consortium focused on interventional cardiology.

## Obstetrics and Gynecology

**EDUARDO LARA-TORRE, M.D.**, chief of General OB/GYN, joined **AMANDA MURCHISON, M.D.**, program director for the OB/GYN residency, and **PATRICE M. WEISS, M.D.**, chief medical officer and executive vice president, in coauthoring a chapter on mastalgia for the latest edition of 5MinuteConsult.com, published by Wolters Kluwer.

**FIDEL VALEA, M.D.**, chair of Obstetrics and Gynecology, coauthored an article in the July edition of *Gynecologic Oncology*. The article is titled “Constitutively active ESR1 mutations in gynecologic malignancies and clinical response to estrogen-receptor-directed therapies.”

## Psychiatry



**DAVID HARTMAN, M.D.**, Psychiatry, was presented with the 2019 NCAD Champion Award—for

exceptional performance and leadership within the addiction recovery field—during the National Conference on Addiction Disorders in August.

**ROBERT TRESTMAN, M.D., PH.D.**, chair of Psychiatry & Behavioral

## Provider Excellence

The Carilion Clinic Provider Excellence Awards recognize providers who demonstrate dedication and exceptional care to patients, families, staff, and fellow providers. Recipients are nominated by their colleagues. This year’s recipients were:

**CHRISTINA DUNBAR-MATOS, D.O.**, Cardiology, who received the Provider Excellence Award for Physicians.

**CRISTINA TROUT, N.P.**, Family and Community Medicine—Blacksburg, who received

the Provider Excellence Award for Advanced Clinical Practitioners.

**LINDSEY BIERLE, D.O.**, Internal Medicine, who received the Provider Excellence Award for Residents and Fellows.

Medicine, presented “What Is Effective Treatment?” and served on a panel for a Neuroscience and Law conference in Roanoke in April. The conference—subtitled “Exploring Addiction and the Application of Brain-Based and Behavior Science to Law, Finance, Treatment, and Public Policy”—was hosted by Virginia Tech Carilion, the Fralin Biomedical Research Institute at VTC, Carilion Clinic, and Virginia Tech.

Dr. Trestman has also been named chair-elect for the Behavioral Health Council of the American Hospital Association.

## Radiology



**EVELYN GARCIA, M.D.**, Diagnostic Radiology, was elected president of the Virginia chapter of the American College of Radiology, and **SAM NAKAT, M.D.**, co-chair of Radiology, was elected as an alternate councilor.

## Residency and Fellowship Programs

**TOM LIU**, a fourth-year medical student, **KATIE HOWE, M.D.**, a Surgery resident, and **MICHAEL NUSSBAUM, M.D.**, chair of Surgery, won first place in the Surgical History Poster Competition at the Clinical Congress of the American College of Surgeons in San Francisco. Their poster was titled “A Long Way to Washington: Establishing Surgical Care for Black Appalachians in the Early 20th Century.”

**BADR RATNAKARAN, M.B.B.S.**, Psychiatry resident, was selected as one of two candidates for the Psychiatry Residency in Training Exam (PRITE) fellowship by the American College of Psychiatrists in 2019.

## Affiliated Institutions

**MICHAEL FRIEDLANDER, PH.D.**, Virginia Tech’s vice president for health sciences and technology and executive director of the Fralin Biomedical Research Institute at VTC, and **SHARON**

**LANDESMAN RAMEY, PH.D.**, a professor and distinguished research scholar at the institute, were named fellows of the American Association for the Advancement of Science.

## International

**JOSHUA ADAMS, M.D.**, director of Carilion Clinic’s Aortic Center, gave several presentations in Liverpool, United Kingdom, in May. At the Critical Issues Europe conference, he presented “NICE Guidelines for AAA: Same evidence base, different guidelines; What is correct?”

Dr. Adams also gave two presentations at Endoluminaries 2019: Endovascular Strategies for Complex Cases—Arch, Secondary Interventions & Type B Dissections. His presentations were titled “Staged endovascular repair of chronic Debakey type III dissection with intentional preservation of false lumen flow during FEVAR: a strategy for reducing spinal cord related complications” and “Urgent FEVAR to treat symptomatic AAA and bilateral iliac aneurysms.”

## Carilion Executives Named to National Lists

**NANCY HOWELL AGEE**, president and chief executive officer, was named No. 9 on *Modern Healthcare’s* list of 50 Most Influential Clinical Executives for 2019.

**PATRICE M. WEISS, M.D.**, chief medical officer and executive vice president, was named to the Becker’s 100 Hospital and Health System CMOs to Know for 2019.

**DON HALLIWILL**, executive vice president and chief financial officer, was named to the Becker’s 100 Hospital and Health System CFOs to Know for 2019.



## MAKE NO MISTAKE

The human factors approach, relatively new to health care, seeks to build systems that protect against human error. **BY SARAH HENRICKSON PARKER, PH.D.**

I WAS LOOKING AT A HEART. A real heart. It was beating. Inside an alive human being. I could see actual ribs. I could see lungs. It was the coolest thing I had ever witnessed.

I looked over the blue anesthesia drape toward the other end of the operating table. I exhaled into my surgical mask, trying to remember to breathe while not fogging up my protective eyewear. When I glanced up, I realized the surgeon was looking directly at me.

“Who are you?”

I had just started a job working on human factors in the cardiovascular surgery operating room. My boss had instructed me to “go to the OR and check it out.” So that morning I had dutifully arrived at a randomly chosen cardiovascular operating room at the hospital where I was working at the time and donned scrubs. I was told to stand either behind the perfusionist or at the head of the bed with anesthesia. And to not touch anything.

In that moment of the surgeon’s scrutiny, it struck me that the directive “go to the OR” might involve a larger permission structure than I had naively realized. I also thought about how new the application of human factors to health care actually was—and that I would need to have a succinct explanation in my pocket at all times going forward.

“My name’s Sarah,” I said. “I look at human factors. I’m interested in how people think and do their work.”

“Oh,” he scoffed. “Are you going to tell me what I’m doing wrong?”

Human factors is a scientific discipline that draws from psychology, anthropometry, and engineering to understand human capabilities and limitations and apply that knowledge to the design of work. A human factors professional is taught to consider the design of the tools, machines, products, contexts, and environ-

ments, as these “system factors” influence how humans do their work. Flawed designs can facilitate mistakes.

Traditionally, health care professionals have been told to work harder and better, concentrate more completely, and, if they truly care for their patients, never make a mistake. At Carilion Clinic, our human factors team has the opportunity to witness how our extraordinary clinical colleagues do their work, and we think about how we can design work systems to assist them in doing the job they trained so hard to do—care for patients.

Our team has collaborated on projects ranging from redesigning a crash cart, to evaluating new software and hardware prior to purchase, to developing infection prevention measures to improve outpatient dialysis. Carilion has made a unique investment in operationally driven human factors resources as a source for continuous improvement.

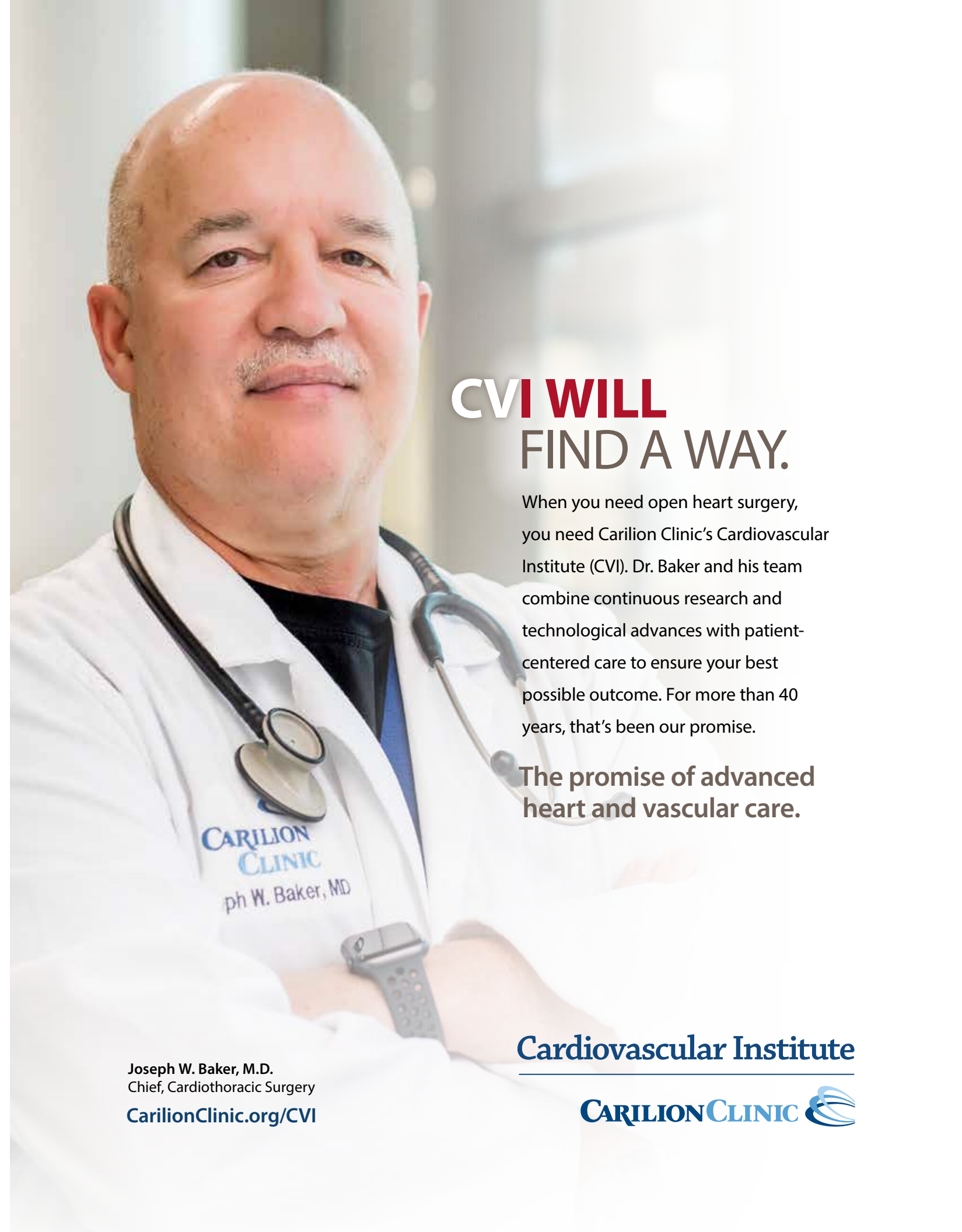
Over a decade and a half has passed since that surgeon asked whether I was going to tell him what he was doing wrong, and I still remember my answer: “I have no idea what you’re doing; how could I tell you it’s wrong?”

Even though it was a nervous response in the moment, it remains accurate. Our job as human factors professionals is

not to tell people what they are doing correctly or incorrectly. Nor would we ever be able to do that in a complex domain like health care. Rather, our job is to see the whole system and how it influences frontline work.

We consider how humans do their work—and how we can design good systems for them—to ensure the result we’re all seeking: excellent, patient-centered care. **CM**

*Sarah Henrickson Parker, Ph.D., is senior director of Carilion Clinic’s Center for Simulation, Research and Patient Safety and a research assistant professor at the Fralin Biomedical Research Institute at VTC.*



## CVI WILL FIND A WAY.

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Joseph W. Baker, M.D.  
Chief, Cardiothoracic Surgery  
[CarilionClinic.org/CVI](http://CarilionClinic.org/CVI)

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## TRAIL SETTING


 Virginia's Blue Ridge—now the setting for Carilion Clinic's sponsorship of the Ironman triathlon—has long been a premier destination for outdoor recreation.



## online exclusives




### Setting the Stage

 With a \$1 million seed gift, Carilion Clinic has launched a fundraising campaign for a new cancer center.




### One-Stop Shop

 Carilion Children's will soon have a new, expansive home for its outpatient services—at the site of a former J.C. Penney.



### In the Meadow

 Carilion Clinic employs a secret weapon when it comes to maintaining the site of its solar panels: sheep.

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