



KRISTIN COOK, MD, COPY TO COME

TRAUMA:

The Research behind the Excellence

It's not enough to save the lives of thousands of severely injured patients in the state's busiest Level 1 trauma center every day. For decades, this team has also been conducting award-winning research to change the practice of medicine.

WORDS BY MARYANN BRINLEY / PHOTOGRAPHS BY JOHN EMERSON

K

ristin Cook, MD, smiles and admits that she is still trying to decide what she wants to be when she grows up but she thinks it just may be a critical care surgeon. Her mentors in the UMDNJ-New Jersey Medical School's Division of Trauma and Critical Care, Department of Surgery, including Chief David Livingston, MD, are convinced of her bright future in medicine, wherever she lands. She is in her fifth year

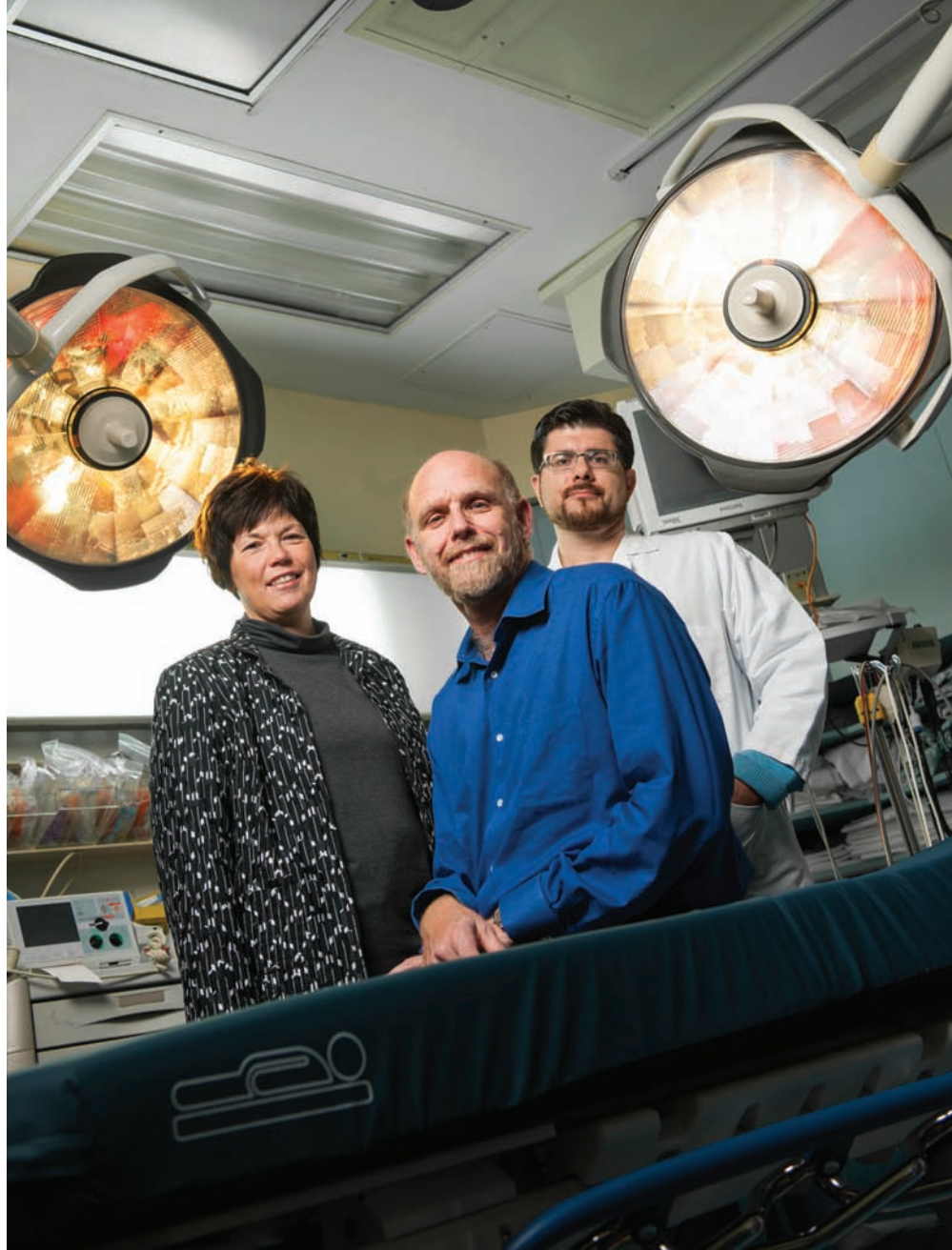
of a seven-year long surgical residency program that has included an extra two years of research.

Last year, Cook won first place from the American College of Surgeons' Committee on Trauma in a national competition for her clinical research into signs of bone marrow failure after severe trauma, a project that was built upon a long-standing topic of exploration by her department. This award-winning paper and presentation didn't include Cook's other area of investigation that she pursued during her laboratory years: the use of stem cells to heal wounds. "I am incredibly proud of that work which measured how mesenchymal stem cells were modulating the immune system to promote healing. And there is no cross-reactivity or rejection of these cells by the immune system. Theoretically, you

could just grab them off the shelf like Tylenol. You could have a stock supply. That's the future of this application," says this young physician, wife, and mother of two, ages 4 and 1 ½. "Like so much research, it was a rough start but I was given a lot of independence and allowed to run with my ideas. Things started clicking and falling into place by the second year."

Her experience as a surgery resident illustrates the untraditional side of the team of academic trauma surgeons at NJMS, especially when compared to the stereotypical definitions of their specialty as cold, hard, and dehumanizing. In fact, Cook was very visibly pregnant when she interviewed for her residency. Unlike other surgical residency programs – and she looked up and down the east coast in order to stay closer to family members who have made this marriage of medicine and motherhood work so well — "Everyone here was so supportive. The chief resident who interviewed me has three kids and there were so many women in the program already. There is camaraderie. The Department of Surgery feels like family to me, not just co-workers. It makes this job feel more like a career and a calling." Starting out in 2008, she was also given the option to pursue a research track if she chose, without committing upfront. It wasn't until the middle of her second year that she knew she wanted to go into the lab. "Research is a strong component of an academic medical career; it is the kind of career in surgery that I hope to pursue." Anne Mosenthal, MD, Professor and Interim Chair, "has been a role model for me. She looks at the whole person, not just one problem."

There is a phrase heard often today in medicine — "from bench to bedside" — describing research being done in a laboratory



LEFT TO RIGHT: COPY TO COME

by someone working at a “bench” that can be quickly applied to a patient lying in a “bed.” At NJMS and University Hospital (UH), a rare team of very busy clinician-scientists take their findings directly into the surgical suite, the EMS ambulances, and the NorthStar medevac helicopter bringing patients to the state’s busiest Level 1 Trauma Center where more than 5,000 of the most severely injured are treated day and night, 24 hours a day, seven days a week, every year. In effect, care starts before the patient reaches that hospital bed.

“This is such a great place to work and learn because of the severely injured patients who arrive in pretty rapid fashion and within minutes” of being injured, explains Ziad Sifri, MD, associate professor.

“Trauma is never boring. There is a lot of action, a lot of drama and the adrenaline is flowing all the time. It challenges you physically, mentally and emotionally but it is very gratifying when you succeed in helping a patient. We think research is very important for trauma because it allows us to answer questions that we are asking every day as clinicians.” Sifri also values the team spirit. “We have the opportunity to really make a difference and save lives working with the trauma nurses, the residents and everybody involved.”

“Coming up with new solutions to treat severely injured patients allows us to expand our medical knowledge and to be intellectually stimulated,” he says. However, he admits that the life of a busy

trauma surgeon hardly allows time for research. That’s why, “We have the great pleasure and luxury of working with our residents who become our extensions.”

Cook completed her research stint this past summer in the laboratory under the direction of Associate Professor Alicia Mohr, MD, as well as Livingston and Sifri, who was her primary mentor on the stem cell project. Now, she is back in the hospital treating patients. “It was nice to work as a team where the students and residents did a lot of the leg work.” From year to year, these residents pass along their findings from one to the next in line. It was the resident before Cook who actually grew the stem cells from the bone marrow of cloned rats and proved that they could be injected into an animal model and grow. Cook took that “proof of concept” and found out how the stem cells were changing the immune system, healing the wounds. Now someone else has taken up where she left off. “It’s really interesting to be part of something that might come into clinical practice one day. You know you’ve done a good job when you can answer a question and with that, comes two more questions,” she adds.

In trauma research, there is often a preconceived idea of what the results are going to be. “Most of the time, we have had clinical exposure to the problem so when we do a study, it is to confirm what we think is really happening,” Sifri explains. But not always. One that surprised him and that was presented at the American Association for the Surgery of Trauma: “We discovered that the sooner patients receive tracheostomy tubes for respiratory failure, the shorter duration they will have on mechanical ventilation. This timing of the trach to liberation from the ventilator is a constant so it was a real ‘aha’ moment for us.” Unfortunately in trauma, there is so much out of a physician’s control. Now, “this is one variable we can control and that has really highlighted the beneficial impact of a tracheostomy. The work is leading to other studies we are doing.”

“We’ve been doing research for 25 years,” explains David Livingston, Chief of Trauma Surgery. Over the years, this real life “ER” team has often made news headlines and been the subject of fast-paced television drama because of the life-and-death drama inside the unit, but under his direction and encouragement, the group has quietly been “involved in so many areas of research from pedestrian injuries to basic science and other clinical problems. All aspects of the research are aimed

at preventing injuries and getting people back to health if possible.” Livingston, who is Director of the New Jersey Trauma Center at UH, has focused on anemia after injury for more than two decades. “I fell into this area by accident more than 20 years ago when I was a fellow and I’m still probably one of the few trauma surgeons” studying why formerly healthy trauma patients are unable to generate sufficient red blood cells in response to trauma. He points out that all blood comes from bone marrow. “Thankfully, our blood supply in the U.S. is among the safest in the world and even though we transfuse people less often than we used to, a critically low level of hemoglobin is reached about once a week in intensive care patients. People who are really injured badly remain anemic for a long time, from six months to a year.” In fact, more than 80 percent of trauma patients admitted to the Surgical Trauma ICU at UH receive

Rameshwar, PhD, along with Livingston. Mohr explains, “It’s rare and very hard for clinicians to do research. You have to be very good at multi-tasking and structuring your time to get it all done,” she says. A senior member of the team, Mohr worked in Livingston’s lab back when she was a resident and now as a faculty member, he has encouraged her to pursue the research. “I’ve been doing it for 12 years,” she says, “basically focusing on the catecholamine response to injury and how that affects the bone marrow. It makes sense because a lot of our patients are anemic and nobody had really looked at the bone marrow component.”

Beta blockers can stop the fight or flight response and had been used for cardiac patients after heart attacks but there were “few people examining this novel piece of the catecholamine puzzle” for severe trauma and hemorrhagic shock victims where this

as the population ages. For the past two decades, the department has published between 6 and 15 scientific papers each year. “Trauma is still the leading cause of death in persons under the age of 45 but this is a moving target as the demographics change.” Not only are more older people being injured but decades of conflict in the Middle East, Iraq, Afghanistan and around the world have resulted “in a huge, unfortunate number of head injuries, amputations and other critical issues that need our attention.”

As he enters his 25th year of working at UMDNJ, Livingston looks back as well as forward. “I think this is such an outstanding trauma center. Because of the patient volume, the excellent clinical care and the commitment to pursue research, we have been able to attract people not only in surgery, but also in orthopedics, neurosurgery, and other specialties that are involved in

Over the years, this real life “ER” team has often made news headlines and been the subject of fast-paced television drama because of the life-and-death drama inside the unit, but under his direction and encouragement, the group has quietly been “involved in so many areas of research from pedestrian injuries to basic science and other clinical problems.

weekly blood transfusions. The question from the beginning was why.

Another one of the group’s papers published last year in the *Journal of Trauma*, titled “Does Beta Blockade Post Injury Prevent Bone Marrow Suppression?” is just one of their more fruitful lines of intervention in this area. “It seems that your catecholamines, your adrenals, norepinephrine, play a role in immune suppression and bone marrow dysfunction. People fail to realize how revved up the systems of our patients are. It’s like they are persistently running a marathon, pumping, pumping, pumping catecholamines out for months,” Livingston says. So the next question was: How do you turn off this runaway response?

Fellow surgeon Mohr was the lead author on that study, working with Ihab O. ElHassan, MD, Edward J. Hannoush, MD, Ziad Sifri, MD, Michael D. Offin, BA, Walter D. Alzate, BA, and Pranela

stress response activates the sympathetic nervous system. “This is a novel way to look at trauma and organ function.” Others had studied the gut and the lung but not bone marrow. In trauma patients, Mohr reports, “We asked if we could do something to eliminate the body’s response. If we administered propranolol immediately after the patient was resuscitated, would it have an impact on the patient? And it looks like it does.”

When asked where the research work is actually done, she points across the hall from her office in the Medical Science Building on Level G. “Right there,” she says with a smile, “we are working with animals now. But we are collecting data to start a little pilot project soon with patients. Ultimately, there will be a big multi-center trial.”

Researching trauma has never been more important to Livingston, especially

trauma care. At the end of the day, it’s the patients, colleagues, residents and students who have made this a really worthwhile career.” And like the proverbial village it takes to raise a child, he adds, “It takes a lot of people to run a trauma center” including the trauma nurse coordinator, trauma prevention coordinator, registrar, physician assistants, therapists and more. Other MD members of Livingston’s team include: Adam Fox, Devashish Anjaria, Peter Yonclas, Leslie Tyrie and Anastasia Kunac. The department also graduates an average of six to eight residents annually.

As for the future of his protégé Kristin Cook, he is less uncertain that she is. “She is awesome.” To which she responds, “I have been fortunate to benefit from the guidance of mentors like Dr. Livingston. He has even offered to give me life advice when it comes time to look for a job.” ■