

BODY, MIND, AND SPIRIT



Essays from Osteopathic Medical Students

Editor: Tyler Cymet, DO

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AMERICAN ASSOCIATION OF
COLLEGES OF OSTEOPATHIC MEDICINE

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INTRODUCTION

TYLER CYMET, DO



Writing is a way of sharing thoughts and starting conversations. The act of putting ideas on paper or computer pushes a writer to build upon those thoughts while structuring them in a way that is engaging to a wide audience. Through effective writing, the author can show how his or her shared ideas fit into the larger society, and how individuals, groups, and even a profession can be defined within the society.

These essays are the work of osteopathic medical students grappling with the issues of the day. The writings shed light on how the osteopathic medical profession looks at health, how it practices health care, and how it views itself within the larger health care system. They come at a time of evolution within the profession.

Osteopathic medicine is currently going through major changes. The profession is expressing its commitment to a single standard for all physicians, including a single graduation medical education accreditation system, regardless of the specific designation or degree that the individual has earned. The same basic standards must be applied to all fully-trained physicians, and all physicians with the same title must be considered at the same level—regardless of whether they are DOs or MDs.

However, the osteopathic medical profession is also committed to maintaining its distinctive characteristics. The field of osteopathic medicine is established on a philosophy of care that starts from the patient, aiming to optimize the health and functionality of the person's body, mind, and spirit. Osteopathic medicine is working to position itself as the group of physicians who best understand the patient as a complete individual.

Furthermore, osteopathic physicians have historically been connected to their individual communities from the time they start their training at osteopathic medical schools. Colleges of osteopathic medicine strive to train introspective physicians who are aware of their own feelings and how they, as health care providers, can maximize the health of their patients and their own well-being.

DOs look at the world differently, and the history and philosophy of osteopathic medicine gives perspective into the changing health care landscape. These writings reveal how our students see themselves fitting within our current health care system.

The essays in this book were written by osteopathic medical students who were chosen as their medical school's student DO of the year or researcher of the year, or who were highlighted in the "Students of Medicine" blog produced by AACOM's Council of Osteopathic Student Government Presidents (COSGP). These essays are representative of the culture we see within the world of osteopathic medicine today.

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GERARD HOLDER



Growing up in the heart of Los Angeles, California, the thought of fully engaging with my community in a positive light was often clouded with the strong influences of ringing gunfire, activities of gangs, and infiltration of drugs. Although these influences affected my family personally, I credit the wisdom of my parents, immigrants from Trinidad and Tobago, for guiding my siblings and me to explore ways to see beyond our current situations. Fast forwarding several years later, I would also now credit an institution, the Alabama College of Osteopathic Medicine (ACOM), for

setting the tone of my growth in finding the best of myself in the service of, and engagement with, others.

In my first two years at ACOM, I made it a top priority to engage with my fellow classmates and the administration through leadership positions in the Student National Medical Association (SNMA) and Inaugural Student Ambassador Program. As the 2016 chapter president of SNMA, the nation's oldest and largest independent, student-run organization focused on "Diversifying the Face of Medicine," I encouraged my peers and the administration to understand and construct solutions to eliminate health disparities. Extracting my experiences from programs and community events that focused on health disparities during my time at the National Institutes of Health (NIH), I turned the words of SNMA's motto into actions. It began with my vision to create a unique event, the Taste of ACOM, which has now become a much-anticipated annual event allowing students to appreciate the various cultures at ACOM as represented through amazing entrees and dishes. Additionally, having a passion for addressing challenges in younger populations, I encouraged my executive board to start a program, the Minority Association for Pre-Medical Students, that allowed ACOM students to share their pre-medical experiences and advice with minority pre-medical students at Troy University, in Troy, Alabama. This passion was also reflected during my time conducting research at Harvard Medical School, where I was invited to speak as a panelist to several underserved high school students interested in science and medicine. My primary wish as president was to better understand and ultimately address the needs of my local community.

As a result of my desire to engage and uplift the local community, I had the privilege of meeting, on several occasions, with a community organization to successfully set up a health fair in the most underserved region of Dothan, AL. During this health fair, we invited other student organizations, such as Family Medicine and the Student American Academy of Osteopathy, to provide much-needed services, including blood pressure

Gerard Holder

checks, blood glucose checks, free clinic service referrals, and osteopathic manipulative medicine. This was a rewarding time as we—students together with our institution—built on the foundation of community service and fully engaged with our community.

Although I knew that my third year of medical school would be taxing, I never wavered in my desire to continue engaging my community. During my third year, I had the honor of becoming a nutritional assistant with Feeding the Gulf in Mobile, AL, an organization committed to providing food and education on healthy nutritional options to underserved, at-risk communities. Furthermore, I continued to use my excitement for community service by participating in—and currently serving as the course director for—the American Medical Student Association (AMSA) Advocacy Scholars Program.

During my time as a student, I led a community project that focused on solutions to support respite care for the homeless, including women and children in Mobile, AL. As I complete my final year in medical school and look back on the days in Los Angeles when a career in medicine seemed like an impossibility, I continually count each experience as a blessing and I am grateful for every opportunity to give back what I've learned to my community. With the goal of a career in pediatrics, I hope to continue my passions for community service and mentoring, specifically to make a positive influence early in a child's life. As a first-generation college graduate and the first in my immediate and extended family to pursue a career in medicine, it is my sincere hope to one day not only be the physician, but the mentor, who will help guide children and adolescents from communities similar to that in which I grew up. I seek to give back the blessings that I have acquired.

HALEY FRANKLIN



Research is vital to the progression of medicine. For us to better serve and treat our patients, treatments must always be evolving and adapting. In order for treatments to improve and progress, research must be performed. It has been important to me throughout my academic career to not only stay involved in bench research, but to also attend conferences that allow me the opportunity to learn from others' research. I believe that staying up to date on current research is crucial to my ambition of being a good physician.

My research this past summer was under a larger umbrella of research currently being done at Emory University that focuses on understanding the spinal cord circuitry changes that occur after peripheral nerve injuries. This particular project interested me because nerve injury is very challenging to treat in the clinic, and physicians are in need of better treatment options. Following nerve injury, the motor and sensory axons degenerate distal to the injury site, but they can eventually regenerate in the periphery given the appropriate conditions. However, the efficiency and specificity of axon regeneration can vary greatly depending on the type of injury sustained. Alterations in circuitries are not reversed by regeneration. The laboratory work in which I participated seeks to understand these intricate pathways in the hopes of one day pharmaceutically upregulating the beneficial genes in nerve regeneration while down-regulating genes that negatively impact regeneration time.

In order to further understand the signaling mechanisms involved in this process, it was important to determine if an equal number of motoneurons (MNs) are injured in crush and transection peripheral nerve injuries. If there were a varying number of motoneurons injured in a cut vs a crush injury, then we cannot conclude that the differing number of receptors is independent of the number of damaged axons. My research this summer showed that the same number of motoneurons are injured in both a sciatic nerve crush and a cut injury. This allowed the PhD student I was working alongside to continue his research on receptors such as VGLUT1, and to definitively conclude that the type of injury sustained directly impacts the expression of this transporter. This will ultimately help researchers discover pharmaceutical agents that can directly target such receptors to hasten the recovery of peripheral nerves when future patients sustain injuries.

I hope that throughout my career I am able to maintain my love for research, if not by participating in bench research myself, then by staying involved in medical conferences to learn from others' research. I aim to always practice evidence-based medicine and stay up to date on current research. I want to always provide my patients with the best treatment options available for their diseases.

JESSE RASZEWSKI



I began conducting research as an undergraduate student, but I did not fully realize the crucial role it renders. It was not until I was accepted into the Nth Dimensions' Orthopaedic Surgery Summer Internship during medical school that I realized the impact that research has on medicine. Orthopaedic surgery is my chosen discipline, and I will continue to implement research in this field when I begin to practice medicine. During my internship, I designed a project that analyzed how cost-effective it is to incorporate educational materials into treatment of patients in the lower socioeconomic

status. Overall, the project produced statistically significant data that exhibited increased patient adherence and satisfaction and decreased patient BMI, which could prove beneficial in any clinical practice. The findings reinforce the principle of approaching each patient as a whole, as well as the osteopathic values of the Council of Osteopathic Student Government Presidents.

My research mentor's goal was for me to generate an idea, implement the plan, and assess the data during my internship experience. The idea was to create a simple implementable way to increase patient adherence and satisfaction with the use of educational materials. I chose to approach a high-incidence patient complaint in orthopaedic practice: lower extremity pain. The main syndrome I wanted to educate patients about was osteoarthritis, because this is the leading cause of lower extremity pain in adults. I had an eight-week window to implement the plan within a solo orthopaedic practice. So I developed an assessment survey, an educational brochure, and a video. The first phase was the clinical recruitment stage, with certain exclusion criteria. I included patients 18 years or older, presenting with lower extremity pain, with no prior surgeries. A typical encounter was composed of providing informed consent, educating the patient, presenting a short video, and giving the brochure to take home. Four weeks later, I followed up with the survey to assess the patient's health. I recruited 25 patients into the study. Even with such a small sample size, I was able to produce clinically significant data. Patients responded very well to the incorporation of educational materials. There was increased patient satisfaction and decreased BMI and overall weight. These findings are beneficial in the setting of orthopaedics because for each pound that is lost, approximately five pounds of stress are relieved from the knee joint. This stress relief decreases pain and increases motivation, which promotes continued healthy practices among patients.

Research is a vital component of education, and without it, there would be no innovation. It is innovation that makes medicine prosper and reach new heights. I was originally

Jesse Raszewski

naïve regarding this principle. It was amazing to see how such a simple concept can have such long-term beneficial effects within medicine. After seeing the effects first hand, I can earnestly say that I will integrate research into my future. As an osteopathic physician, I want to continue to generate ideas that holistically benefit the patient, while creating a more efficient implementation of medicine.

VICTORIA BROWN



More deadly than the World War unfolding alongside it, the Spanish Flu Pandemic of 1918 killed 50 million people worldwide. Eighty years after the flu disappeared, epidemiologists still had little information about the devastating virus. That finally changed when researchers at the Centers for Disease Control and Prevention (CDC) and the Armed Forces Institute of Pathology isolated, decoded, and replicated the entire virus sequence, now known as H1N1. It is thanks to the monumental work of these and other researchers that we are able to develop vaccines against

the virus, reduce the number of deaths, and mitigate future pandemics.

Our research at the Alabama College of Osteopathic Medicine Center for Research continues to study infectious diseases, including influenza, and the details of how they affect the human body. Previous research has revealed that not all endothelial cells are created equally, and, therefore, their responses to infection are unique. Understanding the ways in which each type of endothelial cell responds to infection will help us better understand how to prevent and treat infections. Our research has helped us understand how the various types of endothelial cells respond to lipopolysaccharide, a component of the cell wall of gram-negative bacteria. We have also discovered how gram-negative bacteria are able to penetrate through endothelial cell barriers and infect human pulmonary tissue. This is clinically relevant, especially when considering an ICU patient who has been intubated. Infection rates of *Pseudomonas aeruginosa* in intubated patients are extremely high; these infections tend to appear less than 48 hours post-intubation. Once the infection has penetrated the lung tissue and endothelial barrier, it is able to enter the systemic circulation, making an already immunocompromised patient septic. Improved understanding of the disease pathophysiology through endothelial barriers will provide pharmaceutical targets geared toward treating these types of infections, while at the same time decreasing morbidity and mortality.

After completing medical school, I plan to complete my master's degree in public health so that I may equip myself with the tools necessary to become a physician-scientist and explore topics focused on the advancement of community health, as well as the advancement of osteopathic medicine. I believe that my participation in research now will give me a greater understanding of the research process and proper research procedures. I am interested in several specialties within the medical field, particularly infectious disease and public health. I would like to conduct research on *P. aeruginosa* exposure through the food and hospitality industry, as well as the means to reduce such

Victoria Brown

exposure. *P. aeruginosa* has been known to grow in some of the most adverse conditions, and it has frequently infected soda fountain lines at restaurants and bars, leading to increased infection rates for patrons drinking the soda. Again, understanding the pathophysiology of the infections could provide us with methods for prevention and treatment. This research would contribute to the overall health of communities, and it could be applied to various other settings in and out of the hospital.

JALICIA STURDIVANT



Four years ago, I had the privilege of meeting with and joining the lab of Dr. Mingyi Yao. Under her guidance, I completed my master's thesis on studies elucidating the cardiovascular dysfunction caused by interactions of the matricellular protein, TSP-1, with CD47, a ubiquitous plasma membrane protein. These studies were initiated to begin a novel approach to ameliorate TSP-1–CD47-induced vascular dysfunction. Most of the work for this project was completed in the summer of 2015, though it has continued this summer during my Kenneth A. Suarez Fellowship as

an AZCOM/MWU student.

Cardiovascular disease (CVD) has been a primary contributor to mortality and morbidity globally. There are many factors that contribute to CVD and, thus, many possible solutions. Our research has embarked on a novel therapeutic approach to resolving the CVD crisis by targeting TSP-1-induced cardiovascular dysfunction. TSP-1 represents a fairly new avenue in research, with many actions that have yet to be discovered. Dr. Yao and I, through our research, have shown that this uniquely structured molecule plays a major role in preventing vasorelaxation in the presence of nitric oxide. The inhibitory effects of TSP-1 on vasorelaxation occur through binding with its cognate receptor, CD47, and the effects are exacerbated with elevated levels. Elevated levels of TSP1 are pathological within such diseases as diabetes mellitus, hypertension, and atherosclerosis. Unfortunately, these disorders, which are commonly associated with metabolic syndrome, are reaching record rates of prevalence in the United States. Fortunately, we have identified a possible solution to TSP-1-induced cardiovascular dysfunction. This solution would decrease pathological levels of TSP-1 via an exogenous scavenger molecule composed of human recombinant CD47 (rh-CD47) peptide, the same molecule to which it naturally binds in vivo to illicit its effects. Our studies have demonstrated via countless ex vivo experiments the effectiveness of our model therapeutic agent, and we look forward to the development of a pharmacologic agent that will one day decrease rates of TSP-1-induced cardiovascular dysfunction in humans. This approach has massive potential for saving lives, improving vascular and lymphatic flow, and decreasing the prevalence of hypertension.

Our goal for this agent is to ameliorate the systemic dysfunction to vascular flow and improve the natural properties that will allow one's body to heal itself. As the osteopathic tenets proclaim, structure and function are reciprocally interrelated. We believe that this molecule's ability to restore vascular flow will also improve lymphatic flow, skeletal

Jalicia Sturdivant

muscle function, and the molecular balance to one's system. As an osteopathic student physician, I look forward with excitement to one day improving my patients' health through a therapeutic agent based on our model. I believe that our future agent has the ability to structure a new breakthrough in medicine that can easily be coupled with osteopathic manipulations because it is based on similar foundational principles. Just as immunoglobulin studies have made successful breakthroughs in medicine by utilizing the bodies' own immune system to fight antigens, we will make similar strides with this agent for improving vascular health.

My work with Dr. Yao has inspired me to pursue future studies in postsurgical wound healing. I aspire to become a surgeon who uses minimally invasive techniques that will improve quality of life for patients. I believe that our agent has amazing properties that will improve wound healing and decrease postoperational morbidity. I plan to elucidate the rh-CD47 scavenger's ability to decrease TSP-1-induced ischemic vascular reperfusion injury, which has been a crisis in the field of surgery. I hope to address this issue in my research in the near future. Such research could not only improve the lives of many patients, but it has the potential to lead to further medical advancements that will save lives based on osteopathic principles.

KATHY VO



Why is research a passion of mine? It has allowed me to delve into topics that I enjoy and to strengthen certain unique personal qualities. Research has always provided me with a creative outlet when I wanted to make something I could call my own. The position of a research assistant requires dedication, hard work, and perseverance. The lesson of delayed gratification could not resonate clearer than within this field, as one works toward goals regardless of the outcome. Constant researching of information, perfecting of techniques, and improving protocols also helps

train students how to use knowledge critically as well as effectively. For a medical student attending an osteopathic school, research opportunities can be on the back burner, with less attention for opportunities and scientist-speakers. Luckily for me, I had research experience at my undergraduate campus at the University of California-Irvine, as well as in hospitals after my undergraduate career. Thus, I knew what I liked and how to find those opportunities.

At Arizona College of Osteopathic Medicine of Midwestern University (AZCOM/MWU) in Glendale, Arizona, where I currently attend medical school, I was granted a research fellowship in my first year. This award is offered to one student per lab. My role in the lab included culturing neoplastic cells and their resistant counterparts, and treating them with combinations of chemotherapeutics to test the combined efficacy of these agents. Through my work, I was able to calculate, grow, pass, culture, and cultivate my cells into meaningful research that would later be recognized. There was never a set time in the day that I was required to work. My work hours depended on my personal goals of the day, and, quite frankly, I enjoyed working overtime to enhance my skill set, and I put much effort into my projects. I recall instances when my professors saw me in the lab on weekends and asked me why I was still there. With a smile on my face, my answer to them was always, “I have work to do.” I enjoyed the time to reflect, understand, and take action on my aspirations. My hard work came to fruition when I was able to publish a manuscript that year.

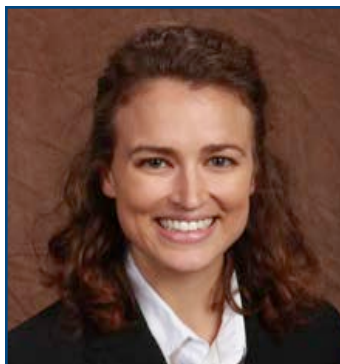
As a current third-year medical student rotating through clerkship, I see the crucial need of being an astute scientist to detect patient ailments, whether it be through patient body-language, certain phrases expressed by the patient, or even a cultural understanding of how one perceives pain or health. My prior research training has allowed me to pay attention to details scientifically, as well as to put all the pieces together to see the patient as a whole. As a future osteopathic physician, the skills I have gained through

Kathy Vo

research will help me look at patients holistically to not only understand them, but treat them. Furthermore, opportunities in the field of research have helped me cultivate evidence-based medicine that can be used to educate patients to increase compliance and strengthen the doctor-patient relationship.

As I look into the near future and onward regarding trends in medicine, I hope to inspire both osteopathic and allopathic students and professionals and to show everyone the high caliber of work by osteopathic physicians contributing to the medical community. My experiences at conferences and symposiums presenting work and meeting seasoned physicians have opened my eyes to a world of shared knowledge and innovative ideas. My hopes for the future include fostering research that creates opportunities for more osteopathic researchers, ranging from clinical to bench research and studies across practices. Additionally, as an aspiring cardiologist, I understand the pivotal role of research in this field, and I plan to continue creating, implementing, and hopefully contributing to medicine for the better. Research has given me a niche to have the autonomy to use my creativity and make my own projects, and I hope to continue sharing my visions with the medical community throughout my career.

ANDREA TUKAN



As a 20-something student entering the long, rigorous educational endeavor of becoming a physician, I am seeking an education and residency that are meaningful pursuits and that will allow me to reach my professional goals. With this in mind, my medical school mantra has become a quote from Eleanor Roosevelt: “Do one thing every day that scares you.” An interesting, unintentional theme of my life is my quest of chasing fear. I am a fourth-degree black belt in Tang Soo Do martial arts, achieving my first-degree at age 11. Upon receiving the degree of black belt, the Sensei

bestows each student with a name that simultaneously defines their character within and the character they are to become. My black belt name is “Bravery,” because as a child my reaction to any new situation that invoked fear was to cry—but, paradoxically, I also dream big and embark on challenging pursuits.

As a medical student, I believe it is common to feel fear. I feel fear about accepting more responsibility in patient care as my training progresses, about the strength of the knowledge base I began building three-and-a-half long years ago, and about the uncertainty surrounding residency applications. However, I work on leaning in, engaging with these and other uncomfortable experiences, because I know that challenge presents an opportunity to transform into the physician I envisioned during my medical school applications.

I am preparing to enter a pediatrics residency. The physical, mental, and social well-being of all children must be considered in responsible pediatrics care, making this discipline a perfect embodiment of osteopathic philosophy. As taught in our osteopathic curriculum, managing a patient’s mind, body, and spirit are necessary treatment components for true healing, and I find this especially necessary for maintaining a child’s vitality. Caring for a pediatric patient has the potential to affect the duration of his or her life, as well as the lives of the patients’ families, and I take this responsibility seriously.

Poignant experiences for me that required total engagement were my overnight shifts in the neonatal intensive care unit (NICU). I had a week of day-shift experience before my first overnight. In that week, I grew accustomed to the schedule and the multiple nurses, fellows, residents, and attending physicians who were there to help me learn every step of the way. My fear was that during the night, my security in my daily routine as a team member would vanish. But on the contrary, throughout my month in the NICU, the overnight shifts became my favorite. They afforded me the opportunity for hands-on learning through deliveries and other procedures, and they gave me increased

patient responsibility. Participating in the care of neonates from the first minute of life in the delivery room—physically assisting their first breath—and then managing their daily care on the floor as their body physiology matures is a privilege. Many protocols govern clinical action for neonate care, and I watch my team implement these guidelines while balancing their years of experience with assessment of the individual patient. The symbiotic relationship between guidelines and instinct that a physician develops reminds me to continue to prioritize lifelong learning and to treat each patient as a unique individual.

Another experience I've had that resonates with the concept of a challenging engagement is working in the pediatric emergency department. These shifts were challenging because I felt unequipped to handle the myriad of medical complaints that are seen on a daily basis in the ED. But shift work ultimately afforded me opportunity for variety and for hands-on learning through the eyes of many different clinicians. The opportunity allowed me to be the first clinician to see the patient and counsel the family. Establishing rapport quickly with the patient and family is important in the emergency room, and I watched my team implement this compassion while balancing a prompt clinical assessment of the individual patient. This fast-paced variety expanded my decision-making capabilities and critical-thinking skills in a different light than had my previous pediatric rotations.

There is not a single component of my medical school career that requires total engagement. Rather, the entirety of smart, passionate medicine requires concentration and total engagement, because human lives are impacted every step of the way. My pediatrics experiences fuel my aspiration to be an astute clinician and to bravely evolve as a conscientious physician as I continue my training into residency.

JASSER KHAIRALLAH



During my fellowship year, I had the opportunity to travel to Nagpur, India, for a global health outreach under the tutelage of Dr. Stanley Grogg and his wonderful wife, Barbara. While our initial purpose for this trip was to provide medical care, we soon developed a secondary aim. India allows licensure of osteopathic physicians only for short-term care. It seemed odd that a group of physicians set to reach 100,000 in U.S. numbers by the year 2020 would not be eligible to work long-term in a country with a staggering population approaching 1.4 billion. Before we could

discover our role in India, we took the opportunity to learn about the current state of medical education and health care services in the country. We toured everything from a large modern research hospital to a school focused solely on Ayurvedic medicine, a field I had not heard of until that point. We learned that Ayurveda is a long-practiced medical system that includes holistic care to achieve a harmony between the mind, body, and spirit. I was dumbfounded. One of the most ancient forms of medicine in India shared the exact same principles as the very field that could not practice long-term within that nation! We knew then that a future for DOs in India was plausible. We simply had to prove that there was a place for our field in the best way that an osteopathic student could: we used our hands.

I had been waiting for that moment since I started medical school: the chance to use osteopathic manipulative medicine (OMM) in areas of a nation stripped of modern medical technologies. The further we drove out from the city center, the closer we got to villages where health care was a luxury. It was here that I got to demonstrate the skills I spent years training to develop. At least half of the patients who came into our makeshift clinic complained of some musculoskeletal problem. I did my best to properly execute the various techniques taught to me throughout medical school on whatever equipment was provided: tables, benches, even a bed offered up by one of the patients who lived a few houses down.

The patient I remember most was an elderly woman who walked in with her arm clutched to her side. After being seen by a physician, she was sent in my direction. A look of uncertainty was evident on her face as she approached me. As I examined her arm and shoulder, she resisted every motion I made. The interpreter did her best to translate my instructions to the patient, but her efforts were to no avail as the patient just stood there wincing in pain. I felt defeated. An hour later, the once reserved elderly female returned to our clinic yelling at the top of her lungs and flailing her arms around. I remember

muttering the words, “Oh my God, I broke her.” Just as I began to think I had ruined any chance of DOs practicing in India, the interpreter leaned in and told me, “Look. She is moving her arm again.” I was in complete disbelief. My eyes began to well up with tears, and the elderly woman wrapped her arms around me as she provided words of consolation. I looked quizzically to the interpreter who explained, “She says do not cry. She says you can perform miracles.” I asked to take her photo and she agreed. I now have her picture framed in my home as a reminder of what wonders are possible with the education I received.

I am certain that osteopathic medicine has a purpose in India. Alongside Dr. Grogg, I had the opportunity to present my use of OMM on almost 100 patients in four days to the Indian Academy of Pediatrics. One of the patients I treated was a former dean at the local medical college who agreed to help us in our endeavors to obtain long-term privileges for DOs wishing to practice in India. Although my career interests have since shifted toward behavioral health, my time in India has surprisingly become more applicable. I will soon face many cultures, including the one I was raised in, that may not acknowledge the importance of mental health. I will be tasked with showing my patients the importance of a healthy mind to nurture a healthy body. If I have learned anything, it is that patience, understanding, compassion, and perseverance can push boundaries past where we perceive our limitations; they may even perform miracles.

PETE WEITZEL



The principle that heat rises is very simple for kids in Albuquerque, New Mexico, to learn. I have fond memories of waking up to the roar of the propane burners in hot air balloons flying over my house. This principle is also true for humans as well. The heat, as well as the pressures and opposition that one encounters in life, can be used to let people soar—if they are prepared to capture the opportunities. This is true for millions of individuals, and it is true for me.

I was born into a loving family on the campus of one of our nation's great universities, West Point Military Academy. I thrived in my new home, I grew and had all the signs of a bright kid. But trouble began in second grade. While I was asking my teacher for more challenging math problems, I struggled badly with reading. This trend continued over the next four years.

During that time, my mother cracked enough skulls to get me tested for learning disabilities. After many hours of testing and evaluation, a few things became clear. While excelling at math, language, and comprehension, I was three grades behind in my reading level. I was diagnosed as having developmental dyslexia.

Although I previously did not have a name for my struggle, my family and I knew early on that something was wrong. One hour, I would be at the top of my class, the next hour I would be dead last. I believe at one point in the third grade I scored 3 percent on a standardized test for reading. During all of this trouble, my family supported me. My parents worked with me constantly for years to improve my spelling and reading. They read to me and inspired me and my siblings to value education. Most importantly, my family reinforced my strengths while acknowledging and supporting my weaknesses. This gave me the resilience I needed to survive the embarrassment and shame of reading out loud.

After my diagnosis, things started to change in slow but substantial ways. I was enrolled in a program that re-taught me the English language from the beginning, and this ended up reprogramming my brain. After two-and-a-half years, my reading skills matched my other academic skills—though I will never win a speed-reading competition. I graduated high school in the top 10 percent of my class. I went on to receive a Bachelor of Science degree in Biophysics at Brigham Young University. Most recently, I've had the distinct honor to join the 125th class of the founding school of osteopathic medicine, at A.T. Sill University in Kirksville, Missouri.

Being dyslexic is a part of who I am. It's grafted into my DNA and forged into my bones. While I have been discriminated against for it, being dyslexic is hands-down the best thing that has ever happened to me. I learned to work hard and to fight for my goals.

Pete Weitzel

I grew in grit and resolve as I repeatedly fell and got back up again. Being dyslexic gave me the heat necessary to rise, and with a little luck I'll continue to rise as an osteopathic physician.

EMILY SHER



After four years of undergraduate cancer research, I was eager to become involved in research at the medical school level. During the summer between M1 and M2, Seth Klapman, a colleague of mine, and I spent three months touring emergency departments throughout Western Europe and North America. Based on Seth's previous work at Epic, the electronic medical records (EMR) company, we wanted to better understand the accessibility of and interoperability between EMR systems in countries with different health care systems.

We interviewed emergency department (ED) staff about the role of past medical history (PMH) on treatment decisions. In countries such as Canada, where instant access is available for all lab values, prescription history, and imaging of every citizen, we were told that ED staff depends on PMH for every encounter. By contrast, ED staff in countries such as the United States, where access to any PMH is rare, told us they rarely use it but wish they could. Most importantly, all the physicians mentioned similar problems and frustrations with EMR; the only difference between the countries was the approach used to solve the problems.

Seth and I found that no country has yet to achieve the full benefits of health information exchange, in which physicians and nurses would receive and use PMH in an efficient and effective manner regardless of where their patients have previously received care. We also found that, despite different approaches to EMR interoperability and associated capabilities, experiences and associated challenges across countries were remarkably similar. These findings suggest that countries need to continue to work to improve health information exchange and that doing so collaboratively would be valuable for patient outcomes. Each country has something to learn from the other countries we visited. However international collaboration on the use of PMH is rare.

Our research does not provide the answers for how a country like the United States could adapt a national EMR. However, despite our country's slow adoption of a universal PMH system, we can take an active role in how the United States, as well as other countries, move forward. If we model publishing more in this area and take the lead in developing international working groups, we can produce the most useful and robust PMH system. No country has to reinvent the "technology wheel." Instead, we can work together to move the science of PMH and EMRs to the next level to make our work easier and our patient outcomes better.

Emily Sher

There is something else that our research adds to not only the emergency medicine and medical technology fields, but also to osteopathy as a whole. Previous generations of osteopaths have had to prove that they are “just as good” as their allopathic counterparts. It is my generation’s job to show patients that we are not “just as good.” Rather, we are different, and that difference will benefit patients. The more research that osteopaths do, the more we can demonstrate that we are an empirically based medical field in our own right.

My research was a collaboration between a DO student, an MD student, and a PhD. It showed interoperability between EMRs, and it put forth a challenge for collaboration across national borders. I am proud that my voice was on equal footing with those two other degrees, and I am aware of the unique point of view that I was able to bring to the table due to my osteopathic training. It is this type of experience that helped me see why my education as an osteopath, not just as a future physician, will make a unique contribution to the field of medicine. Such experience will also help me carry that message forward.

In my future as an osteopathic physician, I will use research the way we are all taught to use research—by using evidence-based medicine. I hope to stay on top of the latest research in my field, so that I am giving my patients the best care possible. I cannot promise that I will be able to do research as an attending. However, I hope that if I see a problem in the field that I cannot find a solution to, I will take advantage of interdisciplinary collaboration to pose the necessary questions and find the answers that will benefit patients and professionals from a multitude of perspectives. We tend to measure success of our interventions at the patient level. But my experience shows me that by taking a broader perspective, one that is multidisciplinary and multinational, more patients are affected, more disciplines are educated, and more doctors can efficiently do what we do.

JENNI ADAMS



I started medical school in the summer of 2014, right after returning from living in Ecuador for two years. My time abroad was spent as an active community member, volunteering full time in public health.

When I moved to Arizona, I was faced with the task of not only starting a doctorate program, but also re-adjusting to U.S. culture and to medical school. During my first month of medical school, I struggled with feelings of isolation and disconnection from my community. Instead of spending my day outside with underserved populations, helping them obtain access to medical care,

I was inside studying by myself. It was at this point that I reached out to one of my medical school professors and advisors, who suggested that I view my learning as service to future patients and my medical school experience as an opportunity to serve others. I took that advice to heart, and I have since engaged myself fully in my academics, serving my school and the local and global communities, and contributing to the osteopathic profession.

I have remained fully engaged throughout all aspects of my medical school career. From serving as president of the Capacidad Health Honor Society, a student group dedicated to training health workers in rural communities in Peru and Uganda, to playing the flute with my school's music club for elderly residents in nursing facilities, I have been serving my community. One activity, in particular, in which I feel like I have successfully served my school, my community, and the osteopathic profession is through my engagement in the Student Osteopathic Medical Association (SOMA).

I began my involvement with SOMA during my first year of medical school as the National Liaison Officer (NLO)-Elect for my school's chapter. I wanted to make a difference at my school by representing my classmates' interests on a national level. I also was very passionate about health policy, and I wanted to encourage other students to be advocates for their patients and communities. As NLO-Elect, and later as NLO, I was responsible for our membership drive, helping organize student participation at DO Day on the Hill, as well as co-authoring SOMA Resolution S-15-09: Health Care as a Fundamental Human Right. I became very involved in resolution writing and health advocacy efforts and was a member of the SOMA national resolutions committee for two years. As a second-year osteopathic medical student, I spearheaded, with the help of my classmates, the writing of SOMA Resolution S-16-20: Support for Title X Family Planning Services. This resolution passed not only in the SOMA House of Delegates

Jenni Adams

(HOD), but also in the American Osteopathic Association (AOA) HOD and is now official AOA Policy H433-A2016.

After feeling the joy of working with other students to create a resolution that promoted the health of the greater community, I decided to run for the position of SOMA national parliamentarian in order to involve even more osteopathic medical students in resolution writing. Since being elected to this role, I have been giving back to my student osteopathic community by mentoring students in resolution writing, chairing the resolutions committee, and helping student-written resolutions get passed in the SOMA and AOA HODs. For example, as representative and delegate to the AOA HOD, I advocated for students by proposing an amendment to the now AOA Policy A219-A/17: Promoting Residency Positions for COCA Medical Student Graduates, to ensure that the policy reflected student interests. Also, as chair of the resolutions committee, I mentored students as they wrote resolutions supporting Deferred Action for Childhood Arrivals (DACA) students and advocating for a single-payer health care system. Through my role as parliamentarian, I have been able to help osteopathic medical students advance the osteopathic profession.

Being able to pass on the drive for helping others through advocacy is one of the many ways I have felt I have been able to serve others through my medical career. I plan to continue my career as a full-spectrum family medicine physician and public health professional. I want to work with an underserved patient population and continue to be involved in health policy and advocacy. And with my experiences in medical school, I will continue to involve my peers in advocating for their profession and their patient populations through involvement in professional societies and resolution writing. I am excited to begin the next part of my medical journey, as I know that my passion for helping others through medicine is what I am meant to do.

ROXANNE WAGGONER



In Las Cruces, New Mexico, there is a daycare facility for homeless and near-homeless children named Jardin de los Niños. My first experience working with these children was in high school through our MESA (math, engineering, science achievements) program. We visited the kids around holidays to bring treats and do special activities. The first time I volunteered with them I dressed up as the Easter Bunny for an Easter carnival and took pictures with the kids. I volunteered with several organizations while in high school, but I recall Jardin de los Niños most fondly. After high school, I went to a

college in Albuquerque, NM, where I lived for five years. Upon being accepted to medical school at Burrell College of Osteopathic Medicine, I moved back to Las Cruces.

Shortly after starting medical school, I received an email inviting me to become involved in a student pediatrics club. I attended the first meeting without much information about the organization. I liked the group, and I soon decided to run for president. As president, the first organization I thought of as a potential community partner for outreach was Jardin de los Niños. I reached out to them shortly afterwards to ask if they would be interested in partnering with our student pediatrics organization. They replied immediately with a “yes.” The first activity we did together with the kids in the pre-kindergarten class was making felt soap and teaching them about hand washing. We also did some “anatomy stretching,” in which we had the kids point to different areas, like the elbow and nose, while stretching their muscles to do so. We ended that day with a game of Simon Says with directions like, “Simon Says touch your toes.”

Since that first visit, I have brought three or four students with me to visit the kids every month. We share various fun and educational activities with the kids, such as anatomy coloring sheets, greenhouses made from plastic bottles, and doctor tool lessons. These visits have become one of the highlights of my month. Jardin de los Niños accepts volunteers of all kinds to come in and work with the kids on various topics, and I am extremely humbled to be able to add science as something these children are being introduced to. I find it incredibly important for children, especially in disadvantaged communities such as these, to be introduced to options for their futures and to know there are people who want to help them realize their potential and succeed.

In addition to Jardin de los Niños, I have helped to establish several other community collaborations working with children and adolescents in such organizations as the Enrich the Kids after-school program, Welcome Baby, and Onate High School’s Health Occupations of America. I also work with members of the pediatrics club to set

Roxanne Waggoner

up informative panels, mini-med schools, and other advocacy events to help young people in this community gain access to information about working in the health care field. Through the mini-med schools, we are able to introduce the medical sciences to kids who otherwise might never realize their interest in the field. Through the student panels, I am able to tell students about my path to medical school and offer tips about how and when to get started with the process. Working with these kids and having the privilege of watching them learn and build new interests is inspiring.

I went to grade school in this community and saw too many friends with big dreams give up on their futures because they were not given the resources needed to pursue them. As physicians, it will be our duty to give back to the communities in which we work. Building these skills of collaboration with other community organizations now will be crucial to my ability to give back in the future in the most enjoyable and beneficial ways. Working with these kids gives me many valuable experiences with these communities. As a physician, I will continue to influence young people to work hard toward their dreams, whether those dreams are medical in nature or not.

I always try to practice sensitivity and understanding while working with underprivileged children. Every time I am involved with an activity with these kids, I learn and witness fascinating new things, such as how they prefer to be contacted and how best to judge their behaviors. These observations will influence my future practice as a physician.

ANI MNATSAKANIAN



Research provides an ever-promising means for consistent and exponential growth in excellent patient care. It is through research that we learn, educate, and improve patient care as osteopathic students and physicians. I view a career incorporating research as my way to answer questions for my patients that have remained unanswered, as well as an avenue to leave a lasting legacy on the medical field. I have been fortunate enough to experience the unique benefits of research in both a large institutional setting and in a small rural environment.

My work in clinical research as an undergraduate at the Ohio State University was focused on improving the quality of life of those diagnosed with muscular dystrophy, amyotrophic lateral sclerosis, and various other neuromuscular diseases. In this particular study, we provided health care teams in neuromuscular medicine with concrete evidence that they were prescribing the correct orthotics for their respective patient populations. My wonderful research mentors and I focused on patient satisfaction and experience with carbon-fiber ankle-foot orthoses in individuals who had progressive difficulty with ambulation. Our research provided statistically significant evidence that the orthoses we were prescribing to patients were improving their quality of life, with an average rating of 89-percent patient satisfaction. The article we published received positive reviews, and what I gained in terms of experience as first author of this study ignited my passion for clinical research.

My role as the research team leader of my medical school's rural student-run free clinic has been an incredible embodiment of incorporating research into the osteopathic physician's career—providing holistic, well-rounded, evidence based medicine to all patients. My duties at the clinic include managing two Institutional Review Board-(IRB-) approved research projects, serving as an administrator to establish research protocols and standard operating procedures of the relatively new clinic, and functioning as a liaison between faculty, patients, and colleagues interested in participating in clinical research. My research teams and I are currently in the process of establishing an exempt "blanket IRB," which will allow for ongoing qualitative data collection for the betterment of our patients.

One of my research projects involves analysis of sexually transmitted diseases (STDs) in our patient population; a retrospective chart review is currently being prepared for publication. My hope is to utilize the data collected from this project to establish STD-screening protocols, patient education programs, and cost-free STD testing for our

Ani Mnatsakanian

patients. Through this project, we were able to meet an area of true need for future research initiatives. My second project is a prospective research study regarding patient experience and satisfaction in the clinic, which is also currently being drafted for publication. This study involves a series of patient surveys gauging our performance as a free clinic. When I began my term as the research team leader, I immediately recruited help for this project. To me, this clinical study lays the groundwork for future students and clinicians alike, as it outlines areas of success as well as areas for improvement. I believe it is important to note that there is extremely limited research regarding patient satisfaction and experience in osteopathic free clinics, and my hope is that our research study will one day aid other free clinics across the country.

My election to the executive board of the clinic as the research team leader has been a tremendous learning opportunity. Since our clinic is student-operated, we medical students have a vast amount of independence over the work we choose to pursue. My goals for my one-year term have been to build a foundation as well as a legacy for passionate and kind-hearted individuals to follow suit. I am proud of my work in this rural clinic, as the research department was almost non-existent when I took on my role. Now we have seven leadership positions on the clinic's research board, as well as a research advisor. My experience at the free clinic incorporates the essence of my beliefs regarding excellent osteopathic care—providing health services to those who may have not seen health care professionals in years.

Through my work, I attempt to provide a sincere form of patient care. I plan to continue my research efforts in community clinic settings as a physician. I believe in serving as an advocate for patients in need, for collaborative teams to accomplish what cannot be done in solitude, and for intentional research to track outcomes of our health care efforts.

RYAN MACHIELE



It has been my privilege for over a year now to learn and grow as a member of a class of 160 hard-working medical students. As president of my class, I witness firsthand the efforts of a multitude of student doctors, whom I would describe as fully engaged. Indeed, the rigor of our education makes this a requirement. Engagement to succeed academically, however, is only the beginning of what is required to make an impact on the world around us as medical students. Everyone I know came to medical school with a foundational desire to have an impact on the world, whether a generalized

desire to “help people” or an unrelenting drive to find a cure for the disease that took a loved one. We all started this journey fully engaged—not just to gain knowledge, but to have an impact outside of our neural circuits. As president of my class, my ongoing project—the impact I wish to have—is to empower my classmates to do exactly this.

The paradox I’ve witnessed is that as we work to expand our knowledge, we become depleted of the elements required to have an impact outside of ourselves, despite our desire to do so. We disconnect from others under the burden of constant tasks. Our personal stressors distort our perception of the needs around us, and we are often worn down—exhausted in mind, body, and spirit. In my estimation, three things are required to have an impact outside of oneself: being connected to others, having the perspective to recognize a need, and having the resources to make a difference. Having a deficit in these elements, we often miss the opportunity to practice what brought us here: that desire to have an impact. Building connection, perspective, and well-being in my community of student doctors is therefore my goal. As this project is ongoing, I will offer a cross-section of my engagement in it during this current week.

Connection is important for my class as the foundation for reaching outside ourselves. To foster interconnectedness within my class, I work together with my vice president to check in with each member of my class on a four-week rotation to ensure that nobody becomes disconnected. We keep a running list that resets every four weeks; as of now I have 22 people to follow up with this week. This proactive engagement takes time, but it is vital to my goal of fostering connection.

Perspective is my second emphasis, as without a clear perspective on the needs of one’s community our impact is ineffectual at best. As part of the Campbell University Community Care Clinic research team, I’ve had the opportunity to produce research that empowers my fellow student doctors to make a greater impact on our community. This week, I’m working with my team to finalize a manuscript that investigates the needs

Ryan Machiele

of specific patient populations in the clinic. We retrospectively analyzed our patient charts and determined that several patient groups seen at the clinic are at exceptionally high risk for specific sexually transmitted diseases. These findings will be used to develop patient-centered initiatives, including better education and improved screening, ultimately enhancing the quality of care delivered to our community.

Well-being is my third emphasis, as without personal well-being, one has little to give. In pursuit of promoting mental health, I hold weekly “office hours” as a peer navigator in which I set aside time to meet with students who may be struggling in order to help them problem-solve and connect them with on-campus resources. In pursuit of promoting spiritual health, I’ve collaborated with faculty and fellow students to initiate a weekly worship and devotional service. In this same vein, I’ve also initiated an Interfaith Council to foster inclusivity and dialogue on medical issues with people from all faith backgrounds.

As I see it, everything we are doing now as students is practice for our lives as physicians. The things we practice now will become easier, and the things we forego will become more difficult. Choosing to reach outside ourselves in service to others should be part of this practice if we intend to make a career out of it. As a future physician, I recognize that the obstacles that may prevent us now as students from having an impact on the world around us will always exist throughout our careers in medicine, and it is my hope that this project of empowering others through total engagement of my community will never reach a conclusion.

CHRISTOPHER FERRANTE



Like many graduating seniors with aspirations of medical school, I was finishing my senior research, traveling for interviews, wrapping up my classes, and trying to savor the end of my undergraduate studies. Not once during my senior year did I ever worry about my health. Then one day in April 2015, that changed.

I noticed a mass on my neck appear out of nowhere. After a day of debating what to do, I went to health services and had an ultrasound on the mass to gather more information. On my drive to an interview, I called a doctor whom I had shadowed and described what had been

going on. He read my ultrasound report and told me to come in the day after my interview for a few tests.

I arrived at the office early on April 21, 2015, for blood work, another ultrasound, and a CT scan. My family and I anxiously waited for my results. When my doctor came in, his face revealed that the news was bleak; I had seen him deliver similar news to countless patients during my time shadowing him. He wheeled in a portable monitor as he scrolled through my CT scan. It revealed masses in my left supraclavicular lymph node and in my left testicle, as well as a large mass surrounding my left kidney. His words rang out, “Chris, you have testicular cancer.”

He assured me that his only acceptable outcome was a cure, then quickly went to his office to arrange my next steps. I was scheduled for a biopsy of my lymph node in two days. The surgery went off without a hitch, and the tumor was graded as a stage-3 mature teratoma. The following weeks were a whirlwind. Between two more surgeries, I successfully finished my research project and graduated from Hampden-Sydney College. The day after graduation, I started my first of four rounds of chemotherapy. Once that stage of treatment was completed, I underwent surgery to remove my left kidney, the surrounding mass, and any affected lymph nodes. After what felt like an eternity, I was declared cancer-free on December 18, 2015.

I was fortunate to have a short and successful treatment, and began to learn the art of medicine. The first and most important lesson was to always try to look at things from the patient’s perspective. After months of being a patient, I began to understand the frustration of not knowing what is going on and of being treated as a disease instead of a person. I vowed to always try to put myself in my patient’s position and treat them like family. Moreover, I learned what type of doctor I didn’t want to be.

I learned that I didn’t want to be the doctor that spent little time getting to know his patients and their families. It became evident that I want to have a relationship with my

Christopher Ferrante

patients so that I can better earn their trust and treat them, not just their illness. Finally, I learned that little things matter to patients. When I was a patient, I had one medical student on my treatment team who would always stay after everyone else had left to make sure I didn't need anything, and he would stop by my room every night on his way out even after a 12-hour shift. I learned that the life of a patient is a difficult one. The days are long, and the tests are numerous. That taught me that every patient deserves to be treated with the utmost compassion when they are in my care. The small touches are what truly made a difference in my morale during recovery. Through this difficult time in my life as a patient undergoing care, I learned much about myself, including developing my idea of what type of physician I want to become.

FRANCIS DEASIS



Medicine is constantly changing and evolving, and research is a major catalyst of this change. My projects involve minimally invasive surgery, focusing on patient outcomes, surgical techniques, and education. As a heavily procedural discipline, surgery is especially reliant on peer-reviewed research, so we can continue to provide the best care for our patients. Working in the Ujiki lab, I have been fortunate to make several contributions to the field through both publications and presentations.

The primary obesity surgery endolumenal (POSE) procedure is an incisionless, endoscopic, and potentially reversible alternative to Roux-en-Y gastric bypass. This is a novel procedure, and relatively few surgeons worldwide can perform it so far. Due to the dearth of knowledge about POSE and the great potential of the procedure, we created a video demonstration of POSE to address this gap. We first presented the video during a scientific session at the Clinical Congress of the American College of Surgeons, which is the largest meeting of general surgeons in the world, and we subsequently published it in *Surgical Endoscopy* (Impact Factor: 3.747). This is the only peer-reviewed POSE demonstration in the literature so far, and it provides a means for surgeons to supplement their knowledge outside of live POSE workshops.

Hernia repair is a mainstay of general surgery, and parastomal hernia repair is one of the more complicated iterations of the procedure. Two repair methods exist—keyhole and Sugarbaker. Keyhole repair was the original method, while Sugarbaker was introduced years later as an alternative with the potential for lower recurrence rates. Successful repair is measured by recurrence rates, and we showed that a modified Sugarbaker repair significantly reduces recurrence. We published this research in *Surgery* (Impact Factor: 3.904) and, in doing so, we were able to contribute to quality-of-care improvement. On a similar note, review articles are invaluable for making information more accessible to the community, and we have published the only meta-analysis of the current literature regarding laparoscopic parastomal hernia repair. We published this research in the *World Journal of Gastroenterology* (Impact Factor: 3.365), and it has been cited 10 times, as of early 2018, according to Web of Science.

Surgical care has rapidly evolved over the past century, and the research focus has shifted accordingly. Because mortality has been significantly reduced, research is now being directed toward improving postsurgical quality of life. Long-term quality-of-life data are sparse, and we are currently working on several projects concerning quality of life after hernia repair. One such project is about laparoscopic totally extraperitoneal

Francis DeAsis

(TEP) inguinal hernia repair. We recently published our two-year outcomes from this study in the *Journal of the American College of Surgeons* (Impact Factor: 4.307), showing significant improvements in patients' quality of life two years following TEP repair. Thus, we have further validated this repair method's efficacy as well as made one of the first contributions of long-term outcomes data to the literature. Laparoscopic surgery was a breakthrough in surgical care because it enabled surgeons to better serve their patients by reducing incision size, postoperative pain, and infection risk. The next evolution of this surgery is needlescopy, which further reduces incision size and postoperative pain. We recently published the results of our nonclinical trial of minilaparoscopic tools in *Surgical Innovation* (Impact Factor: 1.909), showing that laparoscopic surgeons were able to perform a set of standardized laparoscopic surgery training tasks at an acceptable level using minilaparoscopic tools. In showing that minilaparoscopic tools can perform at the same level as current laparoscopic tools, we have taken the first step toward possible clinical trials of such technology in the future.

Although I am currently interested in several specialties, research will be a key part of my practice regardless of what field I match into. I will seek out novel ways to integrate a holistic perspective into patient care and build upon other osteopathic ideas already in practice. In doing so, I hope to use such discoveries to continually improve overall quality of life, thus furthering our profession's reputation for fostering meaningful connections with our patients. Moreover, I want to nurture the drive for discovery in future osteopathic physicians by serving as a research mentor. Above all, I want to strengthen the osteopathic voice in medical research. Research is a major component of what moves medicine forward, and we, as osteopathic physicians, have a duty to ensure that our ideas and contributions are key parts of the process. As an attending, I will do my best to work toward this objective.

KATHARINA R. DE KLERK



Much of my leadership and medical advocacy work in medical school has been focused on two specific issues: increased awareness of LGBTQ+ health care needs, and health care reform. In my first year of medical school, I was convinced that addressing these issues on a local level was the most effective approach to achieving real-world impact. I thought that making small, incremental change was the way to demonstrate effectiveness and build support for these ideas, before pursuing any kind of broader change. So I joined organizations on campus that were committed

to this work and set about trying to make a difference.

As a member of “Pride,” the organization at the Chicago College of Osteopathic Medicine of Midwestern University (CCOM/MWU) committed to supporting and advocating on behalf of LGBTQ+ students, I worked to implement a university-wide elective about LGBTQ+ health topics. I also participated in launching the first “Safe Zone” workshops at CCOM/MWU. These programs were both successful and impactful. We held the first ever “LGBTQI Considerations in the Provision of Health Care” elective, in which more than 40 students enrolled. Participants learned about everything from media portrayal of LGBTQ+ people throughout history, to specific health care disparities faced by LGBTQ+ people today.

Throughout the quarter, participants engaged in interactive sessions and role-play activities to help them develop greater comfort in working with and treating LGBTQ+ people. Separately, we held several Safe Zone workshops throughout the year with students, faculty, and staff, and we received incredibly positive feedback from participants. Many appreciated the opportunity to ask tough or uncomfortable questions, and others appreciated having the opportunity to think about issues surrounding gender and sexuality from a new perspective. However, it became clear to me that there was no guarantee that any of these programs would continue after I was gone. There was no institutional infrastructure to support these programs over the long term, and there was not enough institutional interest in investing in them.

As a part of “Health Care for All,” the organization at CCOM/MWU dedicated to advocacy for single-payer health care, I gave presentations about single-payer health care, brought in speakers, and facilitated workshops to get students actively engaged in the campaign for Medicare for All. While these efforts sparked dialogue among my classmates and raised the platform of the issue on campus, I again faced the same realization

that I had for my other on-campus advocacy projects: these programs could easily disappear if future classes of students didn't have the same passion for the issue.

Thus, I decided to try a different approach—to write resolutions. In my second year of medical school, I authored two resolutions addressing awareness of LGBTQ+ health needs. One called for the inclusion of LGBTQ+ health topics in medical school curricula and for the Commission on Osteopathic College Accreditation to support this by including such a provision in its accreditation standards. The second urged the Student Osteopathic Medical Association (SOMA) and the American Osteopathic Association (AOA) to take a stance in opposition to conversion therapy. These two resolutions both passed the SOMA House of Delegates, and the latter was also adopted by the AOA. It is now considered unethical for any DO to engage in the practice of conversion therapy.

This summer, I started working on a resolution in support of single-payer health care. In the wake of several failed attempts by our government at reforming the Patient Protection and Affordable Care Act and gutting the health care system, it felt important and timely to engage students and physicians in a serious, evidence-based conversation about the benefits of a single-payer health care system. It's a system that stands to improve the efficiency of our health care system, improve access to care, and make health care more affordable for everyone. The resolution was passed by the SOMA House of Delegates in October 2016, and it will be debated and voted on by the AOA in the summer of 2018.

The experience of being involved with medical advocacy on a national scale has been an incredibly empowering experience. Realizing that major policy changes can start at a medical student's fingertips, typing away on a computer about something he or she feels passionate about, fuels my excitement for continued leadership involvement within the profession. It has also helped me to build a network of like-minded students and physicians, who motivate me to keep re-engaging in new issues that impact the field of medicine. These are experiences that I will never forget, and they are lessons that will encourage continued engagement on behalf of my patients, my community, and my profession.

LINDSEY HARRISON



My introduction to medical research began during my undergraduate studies when I met a PhD candidate in the campus cafeteria. I was sitting at a table alone, studying and eating in the crowded cafeteria at the University of California-Davis, when a gentleman asked if he could join me. He asked me how I liked my classes, and I excitedly told him how much I loved my courses in infectious disease, immunology, and genetics. He revealed that he was working on something that connected everything I loved about my classes—the genetics behind resistance to *Mycobacterium tuberculosis* infection.

He invited me to apply for a research-assistant position on his project, and it was this opportunity that formally introduced me to the world of medical research.

Prior to medical school, I was involved in research studies in the fields of tissue engineering and breast cancer. My work in these areas had the ability to impact both patients and medical practice. For example, my original work on creating a novel therapy delivery method for infantile hemangiomas laid the groundwork for moving into more advanced animal and, eventually, human models. This research has the potential to positively affect the lives of children worldwide who have disfiguring and life-threatening hemangiomas. Another study I worked on found that introducing liposuctioned fat tissue into the breast during reconstruction could encourage migration of native breast cancer cells in that region, thus creating a risk for cancer cell proliferation. That study has direct relevance on current surgical procedures and even the health of patients.

For the past year, I have been a research intern at UnityPoint Health Des Moines, assisting the Office of Research with investigator-initiated research related to the emergency department (ED). My two current studies contribute to both emergency medicine and public health knowledge. For a study detailing the use of the IPOST (Iowa Physician Orders for Scope of Treatment) in the ED, I was involved with the study design, submission to the Institutional Review Board, data collection, data analysis, and manuscript creation. We found in this study that many elderly patients in the Des Moines area were not arriving in the ED with the IPOST, an important document on end-of-life care goals. This finding impacts the public health discipline by raising awareness of the need to educate both physicians and patients on the importance of completing an IPOST (or similar state-specific document) in order to have one's medical wishes honored. In my recent work on a study assessing adherence to the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults in the ED, we tracked the patients returning to the ED as a result of using these medications. We found that it may be appropriate to question

Lindsey Harrison

the inclusion of certain medications in the Beers Criteria, and we encouraged a complete reevaluation of the list. These findings have the potential to affect prescribing practices across the country. With each of these studies, I feel that my research work has contributed to the improvement of those particular disciplines and to the patients they serve.

Because of my passion for clinical research, I plan to continue to be involved in this endeavor through the remainder of medical school as well as into my residency and beyond. In the future, I would like to work in an academic medical center where I can balance clinical duties, teaching, and research. Being a practicing physician will provide a platform to ensure that my research studies address current issues in medicine and patient care. The physicians I have worked with have been very enthusiastic about research. However, none of them were osteopathic physicians. As a future osteopathic physician, I would like to help in narrowing the discrepancy between MDs and DOs who perform clinical research. I want to conduct clinical research and mentor interested DO students, residents, and colleagues. By doing so, I hope to contribute to my medical discipline and the patients I serve. I encourage other osteopathic physicians and osteopathic medical schools as a whole to adopt a more supportive stance toward research.

MICHELLE BRENNER



Cancer. A word that brings fear and uncertainty to many, and a disease that has been researched heavily since the mid-20th century. As research progresses with genetic and cell markers of cancer cells, scientists have been successful in the treatment and cure of some cancers. However, scientists have learned over the years that not all cancer is alike. As such, approaches to cure cancer have diversified throughout the years.

My research uniquely contributes to cancer studies by elucidating the potential differences in the metabolism of immune cells and cancer cells. Our hope is that we can modulate the leucine metabolic pathway in a direction that provides an advantage to T cells to better combat cancer cells in the tumor microenvironment. Tumor cells can escape immune surveillance by competing with T cells for common metabolites and redirecting nutrients for their own advantage. Leucine is a nutrient that stimulates protein biosynthesis, while the degradation of leucine provides energy and metabolites for the tricarboxylic acid cycle (TCA) cycle. The first two enzymatic steps in leucine degradation are catalyzed by the branched-chain aminotransferase (cytosolic BCATc and mitochondrial BCATm) and the branched-chain α -ketoacid dehydrogenase complex (BCKDC), which is composed of three enzymes, E1, E2, and E3. The gene regulation of all of these enzymes is largely unknown, but it is important to understanding how T cells and cancer cells interact on a metabolic level in the tumor microenvironment.

The objective of my research is to compare the gene regulation of BCATc, BCATm, E1 α subunit of E1, and E2 in T cells and in their cancerous counterpart, EL-4 lymphoma cells, and to better understand the function of the leucine metabolic pathway in these cells. Thus far, we have completed analysis of mitochondrial RNA (mRNA) and protein expression of these genes in both cell types using various inhibitors. In addition, we performed a bioinformatics analysis to identify potential transcription factor binding sites. As yet, we have elucidated one transcription factor, NFAT (nuclear factor of activated T cells), which impacts T-cell regulation of BCATc and E2, but not in lymphoma cells. We will continue to explore this genetic regulation through transcription-factor binding assays. We are exploring cancer-cell activation from the aspect of nutrition, a novel perspective in cancer research.

Utilizing my experiences as a research technologist for five years prior to medical school, my master's degree in clinical and translational science, and my research endeavors in medical school, I plan on incorporating research into my future clinical practice. I have had the opportunity to perform both basic science and clinical research, and I enjoy

Michelle Brenner

both. I want to become a pediatrician and then specialize. I am currently interested in critical care, cardiology, hematology/oncology, and developmental pediatrics. As such, once I determine my passion for a specialty, I want to explore avenues of potential for either basic or clinical science research based on current needs in the field. In addition, research is a collaborative endeavor. Thus, I want to partner with other physicians and scientists interested in my research question and hopefully create connections nationally or globally that will aid in my research efforts. I will also search for opportunities to work for an institution that supports physician-led research. For example, as a research technologist at the BloodCenter of Wisconsin's Blood Research Institute, I worked with many physicians who led their own research. Therefore, I want to create collaborations and mentorship opportunities early in my career, so that I can apply for research funding and explore complex clinical questions.

While incorporating research into my future practice may seem like a daunting task in the current research-funding environment, my passion for research and its role in advancing medical care for patients will drive me to continue to pursue my dream. I not only want to provide a positive impact for my current patients, but I also want to make a difference for my future patients.

JACQUELINE PASULKA



During high school and college, I was on the rowing team. My involvement with athletics sparked my desire to pursue research in sports medicine. After college, I became a research assistant at Lurie Children's Hospital of Chicago, where I have been involved in several projects within the Division of Orthopedics and Sports Medicine. The first study I worked on examined the effects of sports specialization on injury risk in a population of more than 1,000 athletes. Our group was the first to show that sports-specialized training poses an independent risk for injury when controlling for age and training volume.

This topic has received attention lately, as more young athletes are being urged to specialize in a single sport in hopes of achieving success and future participation at the collegiate or professional level. The primary goal of this research is to help inform clinical recommendations to reduce injury risk in young athletes. For example, we determined that athletes are at heightened risk for injury if their ratio of weekly hours in organized sports to free play is greater than 2:1, or if they train more hours per week than their age in years.

I further analyzed our data by identifying single-sport athletes and comparing injury risk by sports type. I was first author on a paper describing these findings, and I gave a podium presentation on the results at the 2015 American Academy of Pediatrics Annual Conference in Washington, D.C. In this analysis, we found that single-sport athletes participating in individual sports reported higher training volumes, earlier ages of specialization, and more overuse injuries compared with their peers involved in team sports. Currently, I am helping prepare a manuscript on the longitudinal data that we captured on these athletes over a three-year period.

I also have a strong interest in working with pediatric patients who have chronic medical conditions. And as an undergraduate, I majored in psychology. I wanted to apply my background in that field toward research addressing the multitude of factors that play a role in the health of patients, including children. So I sought out an opportunity to work with a lab at Loyola University Chicago that was investigating the role of psychosocial influences on health outcomes in children with spina bifida. As part of this longitudinal study, I conducted home visits with participants and was able to gain an appreciation of their day-to-day lives managing their conditions. By having a small glimpse into their home environments, I could better understand the daily obstacles that some patients faced, whether it was navigating through the home in a wheelchair or trying to maintain independence in activities of daily living.

Jacqueline Pasulka

My desire to incorporate all aspects of a patient's life when developing a care plan became a driving force behind my pursuit of an osteopathic medical education. I found that my research correlated well with the osteopathic focus on addressing the whole person and considering the many influences that affect overall health and well-being. Through my personal interactions with research participants, I was able to discover how I can shape my future practice to better serve patients' daily needs by focusing on their adaptive functioning. I hope to practice medicine with a concentration on pediatric patients with chronic medical conditions and to better understand ways of tailoring treatment plans to maximize their quality of life, cognitive functioning, and community participation as they progress into adulthood. As a future osteopathic physician, my goal is also to contribute to research that identifies ways to improve long-term health outcomes and increase the level of independence that patients have within their daily lives.

In order to further my experiences working with such patients, I pursued an externship at the Rehabilitation Institute of Chicago after my first year of medical school. I was assigned a research mentor and worked to develop a study investigating visual functioning in adolescents with cerebral palsy, evaluating how this condition affected their reading and cognitive skills. During this externship, I also co-authored a paper on the transition from pediatric to adult health care in patients with spina bifida. This paper provided an outline of current knowledge about health issues in adults with spina bifida and emphasized that maximizing quality of life should be the main principle guiding clinical practice. Through my work on this paper, I began to understand how research on outcomes in adult patients with chronic medical conditions can inform pediatric care. I want to continue pursuing such research that will inform clinical decision making in young patients and help to improve their quality of life, independence, and community participation.

JOHN WALSH



Luck, risk, and randomness: they may explain why the high road is less crowded. We blame failure on bad luck; we attribute success to skill; we fail to recognize randomness. Our probability map trends toward sensationalism and simplification. Daniel Kahneman's seminal work on behavior helps to explain this overconfidence and cognitive error. Two systems are used for judgement. System 1 is fast, intuitive, and emotional. System 2 is slow, deliberate, and logical. When luck, risk, and randomness collide, the systems glitch, precipitating unconscious cognitive errors. Hindsight

bias and reversing the arrow of causality are common culprits in research. Our frontal cortex wants to account for strength and weakness. Our amygdala senses the evaluation as an attack; logic is overrun by emotion. Subsequently, the abstract is ignored to focus on the superficial. Therein lies the interface in which we must inject objective assessment.

My time performing neuroinflammation research served to uncover my profound ignorance, while concomitantly nurturing my curiosity. The experience revealed the complex beauty of nonlinear biological systems. The American Hip Institute (AHI) is a collection of senior surgeons who train hip-preservation fellows and research interns. As a research intern, I worked under a senior surgeon who preached research as a requirement. He passed insight from teacher to trainee; but more importantly, he encouraged work with radiologists and statisticians to stimulate diverse thought. While finding my place at AHI, probably through serendipity, my behavior adapted. I realized the importance of asymmetry. If we all had the same opinion, mine would be unnecessary. Thus, I became valuable by questioning the elementary. These questions lead to technique tinkering and ultimately manuscripts, as denoted on my CV. When we ignored professional research boundaries to collaborate with radiologists, we efficiently developed an algorithm to diagnose gluteus medius tears. Such diagnoses are often missed or delayed. My surgical ignorance provided an idiosyncratic perspective leading to reciprocal benefits. I have found there is a flywheel effect, as parallel processing of information provides more perspective in thinking and more diversity of insight.

Mentors have taught me the methods, leaving me to uncover the material. I try to return the favor for those I encounter. Initially uncomfortable, but now productive, I focus on what Nassim Taleb calls the "Black Swan." If you observe 100 white swans, you cannot assert all swans are white. But if you see one black swan, you show that not all swans are white. Our research was directed at disproving our ideas, rather than supporting them. My belief is that it is irresponsible for me to be more precise than I can be

John Walsh

accurate. I am committed to cultivating intellectual insecurity, avoiding cognitive traps, and questioning assumptions. I'm on a progressive system of training, trying to develop tools under the guidance of a diverse set of experienced mentors.

There is an art to the practice of osteopathic philosophy and to investigative research. The diversity and multiplicity of challenges have pushed me toward developing personal qualities and a professional skill composite necessary to help my patients: the root quality from which others may derive benefit. As such, I have sought to enthusiastically pursue self-education and teaching with an open mind. I've tried to continue this mentality at Des Moines University College of Osteopathic Medicine. Every time I teach or tutor, I engage students to challenge and I invite critiques. The constant feedback strengthens all participants' understanding. Showing students with my experience how material has been beneficial has been more impactful than stating its importance. I strive to provide the bridge for my students to cross into the wonderful obscurity of randomness. I focus on participating as a student and as a teacher in research, improving knowledge for myself, my colleagues, and the osteopathic field. This focus allows me to contribute, fulfilling my obligation to the next generation of students and patients on this flywheel—just as my mentors have before me.

I will work to build integrity into my roles as student, teacher, researcher, and physician by further defining my edge of competence. As an aspiring osteopathic practitioner and surgical investigator, I see my roles as student, teacher, physician, and researcher as parts of an integrated whole. I produce research as a corpus, focused on decision-making under opacity—a blend of philosophical and scientific investigation. The idea is to not mistake the unknown for the nonexistent; this is an uncomfortable position for our intuition. I seek to replace my rationalizing-for-simplification heuristic with an appreciation for the asymmetric effects brought on by complexity and randomness. A.T. Still achieved this years ago, relying on the interdependence and complexity of the body, by not treating disease, but by seeking and supporting health.

SCOTT RAY



The opportunity to conduct clinical research in conjunction with consistent patient interaction has fostered an inspiring foundation for my goals as a future osteopathic physician. In particular, working as a medical scribe while conducting research has offered invaluable insight into the clinical applications of my investigative studies. This dynamic approach enabled me to genuinely appreciate the intertwining roles of research and clinical medicine and the profound effect of research on patient outcomes.

As part of a research team, I collaborated with a group of physicians, fellows, residents, and students in order to achieve our aim of refining the diagnostic capability for various cardiovascular conditions, including aortic calcification and cardiac amyloidosis. For example, through the analysis of several imaging modalities, we strived to develop novel, noninvasive techniques to diagnose conditions that previously required moderate- to high-risk invasive methods, such as biopsy of heart tissue and cardiac catheterization. Our project focused on correlating the results of preexisting invasive methods of detection with new patterns visualized on noninvasive methods, such as echocardiography. Implementing this approach, our group could corroborate the imaging findings with established pathological indicators. Ultimately, our results demonstrated the potential utility of this methodology to the discipline of cardiovascular imaging.

Through my routine involvement in the cardiology clinic, I was able to appreciate firsthand the patient preference for noninvasive diagnostic techniques over invasive techniques. Also apparent to me was the lengthy gap in time between the onset of symptoms and the eventual diagnosis. This period of indeterminate uncertainty placed an undesirable burden on patients and providers alike. Always mindful of these experiences, it is my hope that linking these unique imaging patterns to specific disease states will contribute to a safer, more accessible, and more reliable approach to detect cardiovascular disease. In doing so, the medical community may hopefully benefit from not only more advanced diagnostic accuracy, but also from earlier detection of disease with minimal invasive risk and enhanced patient outcomes.

Looking forward to my future as an osteopathic physician, I plan to conscientiously incorporate relevant research studies throughout my medical decision making. It will be my intention to emphasize appropriate evidence-based medicine to determine the clinical decisions that are most suitable for my individual patients' needs. Having cultivated critical thinking and analytical skills throughout my experiences in research, I am excited to one day continue my research efforts to optimize the medical care of my patients.

Scott Ray

Keeping in mind the patient preferences I witnessed as a medical scribe, I aspire to contribute innovative research that not only seeks excellent patient outcomes, but also outcomes that centralize around future patient goals of care, comfort, and trust.

In summary, the opportunity to engage in a variety of research throughout my academic and clinical years continues to sculpt the critical thinking and deductive reasoning skills I one day strive to exercise as an osteopathic physician. My dynamic role as a researcher and medical scribe closely interacting with the study population enriched my view of medical research and showcased the impact of its integration into practice. The ability of my research team to adopt a versatile approach to our work has personally redefined the vital force of research within the field of medicine. Specifically, our research has helped identify unique and noninvasive methods to safely and effectively recognize cardiovascular disease processes. Finally, continuing this work as a future osteopathic physician, I fully embrace the privilege to fulfill patient expectations by diligently correlating research findings with personalized goals of care.

BROOKE BACHELOR



While working as a nurse in rural mountain communities near Machu Picchu in Peru, I saw a lot of tourist-service organizations come into the communities with whole batteries of volunteers to carry out various community improvement projects. In one of the ancient communities, a group of volunteers had just built a number of concrete structures, which were scattered about the area. They were supposed to be outhouses to prevent fecal-oral transmission of disease. A few months later, when I went back to those communities, I saw that each family had adopted one of these

outhouse structures to use as a storage container. No one in the tourist groups had bothered to ask the people in the communities what they wanted, and perhaps they did not even bother to explain what the structures were or how to use them.

Reflecting on these and other past experiences in which I saw many groups come in first without assessing needs, I realized I didn't want to leave that kind of legacy through my service work. Considering my interest in women's health and the recent surfacing of the Zika virus, I decided to pursue a research project while on the trip. I did not find much existing research on the potential gap between contraceptive preferences compared with contraceptive availability in these areas of the world, so I thought this would be interesting to pursue in the context of Zika, which can cause damage to fetuses. I wanted my research to contribute to these communities by uncovering what the people who live there want and by shedding light on their stories and lived experiences. I would also like to eventually work to improve health care efficiency in these lower-resource systems.

With all of this in mind, my research project from 2015 to 2016 focused on learning about community desires regarding contraception, barriers to access, and ideal contraceptives. I hope to encourage other researchers to start with a focus on the desires of those in the community, and to first determine if any intervention is actually desired by the community members who live there full-time. My second research project, from 2016 to 2017, focused on the same communities by studying what the people there knew about Zika virus transmission, if and how they were trying to protect themselves against the virus, and how health information there is shared. My hope through this project is to disseminate a standardized communication model to best convey potentially life-saving health information that can be utilized in various rural, low-resource settings. We are currently in the process of submitting our findings to journals.

My research has helped me realize the importance of considering a patient's perspective on the outcome of his or her health challenges and journey through the health

Brooke Bachelor

care process. In my own practice, I will be asking patients what they think causes their ailments, since they are the individuals living with the problems each day, and I hope to use their feedback to improve my treatment plans as an osteopathic physician. As I go through my rotations this year, I have enjoyed incorporating osteopathic manipulative medicine (OMM) in my work, and I see myself using it quite often as a potential integrative-medicine physician. In addition, I know that I will be traveling to low-resource areas to use my skills as an osteopathic physician, and I want to study stress reduction and management of pain using OMM in such settings in a variety of cultural contexts.

NICHOLE B. SHUMWAY



April of 2015 was when I first recognized my membership in the world's community; I traveled internationally for the first time with a grassroots organization from my hometown. Alongside perfect strangers, I volunteered to work in the underserved village of Mahogany Heights, Belize. The focus of this trip was youth empowerment and goal development in elementary-school children. We spent our days in public schools sharpening their skills in English grammar and encouraging them to look forward to the potential of their upcoming years.

During this trip, I connected with Raquel Vega, a nurse and designated representative for the village from the Ministry of Health. In private, she shared many of the horrific tragedies of the village caused by inadequate health care services. To put it simply, members of her village die too frequently from preventable causes. At that time, she was caring for patients in her home. I remember trying not to stare as I toured her tattered living space. Her couch was worn through the fabric, revealing its underlying foam and structural components. Her stethoscope had rotted in the humidity a couple years prior; she had since not been able to replace it. I noted a small space, measuring about 4 feet by 4 feet, in which she could potentially practice medicine.

She turned to me and said her door was open to anyone, at any time, for any medical need. Even the most gruesome injuries were treated in front of her three young children. She told stories of suturing stab wounds with plastic grocery bags serving as “gloves.” She described numerous incidents of children dying in her home from severe asthma attacks because the village lacks medications and transportation. The nearest hospital is hours away.

This community receives little support in terms of supplies for the health care needs of its inhabitants. Nearly 60 percent of Mahogany Heights' 2,000 residents are unemployed. Most residents do not have any means of transportation, a major deterrence in access to both emergent and chronic health services. A Belizean physician rotates through this village once every few months. Any ailment that arises during that interval must wait.

Impassioned by the story of Mahogany Heights, I felt moved to make a difference for this community. Before leaving Belize, I had asked Raquel if I could do anything for her village. She replied, “health education.” I had little in terms of resources to meet such a request. However, I spent the next eight months organizing and designing a community health trip to Mahogany Heights. The trip took place in January 2016. During this trip,

Nichole B. Shumway

we provided basic medical services and supplies, but, more importantly, we distributed health education materials highlighting the most common ailments of the region. In a “health fair” format, we educated villagers of all ages. As a trip finale, and as a “thank you” to Raquel for allowing us to engage with her village, we set up a health post, or clinic, for the community. We had transported nearly 400 pounds of medical supplies to fill the clinic, which now stands as a suitable place for Raquel to treat her patients.

The following Sunday, we joined the residents of Mahogany Heights at their local congregation. Raquel led the service and, at one point, demanded everyone’s attention as she needed to make a special announcement. Beaming with gratitude, Raquel announced that the new health post would be named after me, Nichole Shumway. That moment continues to resonate with me, and I use it as fuel to get through my most challenging moments in medical school. I never could have anticipated such an outcome for our efforts. I am forever moved by this gesture.

My story shows just how possible it is to find a cause that drives you to make a difference in a community. I was extremely fortunate to make my vision of a community health trip come to fruition. It certainly wasn’t a perfect model, but it was so much better than doing nothing. As I continue to expose myself to educational opportunities related to global health and public health, my next trip is evolving into a more sustainable action. I am slowly learning how to maximize the potential of these short international public health programs, and I hope to foster a long-lasting relationship with Raquel and the community of Mahogany Heights. As I reflect on what I have accomplished in this community as a medical student, I become excited for the even larger impact I can make as a physician. In the meantime, the movement will be continued primarily by providing effective public health education.

I think of the members of Mahogany Heights often. I appreciate them for their genuinely positive demeanor in the face of persistent poverty and illness. They have also helped me better appreciate my own health, comfort, and education. I keep in mind those immense populations who have so much less than I do, but always manage to smile. And I recognize the incredible power I will have as a physician to help guide patients in their paths to health. Communities like Mahogany Heights revive my thankfulness for the opportunities and privileges I have, while renewing my passion for medicine. I have found my niche in underserved communities, and I am confident that my future entails interacting with those populations that need us most. This intention comes from the sincerest desire to maximize my potential as a health care provider, because I have seen how positively this can impact both the givers and the receivers. I absolutely owe these communities my continued support.

DANIELLA RAO



I am a firm believer that a person's character is constantly changing, cumulatively made from hundreds of seemingly insignificant moments. Still, every so often, there are events so profound that you can look back and pinpoint the exact moment when your life was changed permanently. For me, this began on April 22, 2015. The events of the next 48 hours would forever stick out as a glacial divide in my life. There was the person I was before that day and the person I was after.

On the morning of April 24, 2015, my close friend and sorority sister, Hannah, was murdered on our college campus. Two days before, I was lucky enough to spend the evening studying with Hannah for an exam we had the next afternoon. At some point during the night, I explained to Hannah the anxiety I felt about applying to medical school. Frankly, I was scared that I didn't have what it took to be a successful medical student. When I expressed these feelings to Hannah, she responded in a way like only Hannah could. You see, Hannah was one of those people that could befriend any person she met. She was bubbly and outgoing, and she spoke every word with a passion for life like I had never seen before.

"Girl, come on," she said in her typical manner. "Anyone can be smart, but you care so much about people. That is what's going to make you a good doctor. I can see that in you and you will find a school that sees it too, I promise."

By the end of the night, Hannah had not only convinced me that my love of people was enough to be a good doctor, but that I was enough. I went to bed in awe that people like Hannah existed, unaware that our conversation that night had been the last we would ever have.

The days following Hannah's death turned my understanding of the world on its head. During my search for answers, I kept coming back to that conversation. The two of us had been friends since joining the same sorority in our freshman year, but that was the first time I had ever gone to her for advice. Yet, in this one conversation, she said the exact words I needed to hear—words I was not hearing from anyone else. There had to be some reason for that.

Two and a half years later, I still don't have answers. Nevertheless, I have concluded that life has a way of giving you what you need when you need it. On the days I thought my grief, anger, and fear would consume me, Hannah's words kept me going. I could persevere knowing she had believed in me. I started working as a scribe, took the MCAT, and was eventually accepted at Des Moines University College of Osteopathic Medicine

Daniella RAO

(DMU-COM). Maybe I needed that conversation to help me work through the days to come, and maybe, somehow, Hannah knew that.

Now, my goal is to help spread Hannah's confidence, positivity, and zest for life to everyone I encounter. I am currently living out my goal by serving as the wellness representative for our student government at DMU. It is my job to care about the well-being of my classmates, to make sure they know that they are much more than grades, and to remind them that while life can be hard, it is too precious to be unhappy. One day, I hope I can also bring Hannah's outlook on life to each of my patients. I hope that in their moments of weakness, I can be their Hannah, and provide them with the comfort they need to get through their hardest days.

KRISTA HOEVEMEYER



Medicine started out as a default occupation for me. I was an excellent student and I loved science, so why not be a doctor? As I was beginning high school, becoming a physician seemed to be in the realm of possibility for me, but it was more like a dream in which you imagine how your life will end up. I hadn't questioned whether it would turn out to be something truly important to me. Within the next year, I found out just how important physicians and health care can be and would be to me.

My stepfather was in a motorcycle accident the summer after my freshmen year of high school. His injuries included a dislocated shoulder that needed surgery, a shattered pelvis, and a broken leg, but the most debilitating damage was to his brain. When I first saw him in the hospital, he couldn't breathe on his own and he couldn't open his eyes. I thought that would be the last time I saw him alive. He spent eight months in the hospital, which meant my mother also spent eight months in the hospital. So one of my sisters and I were high-school kids functioning mostly without parents. We were extremely fortunate that my mother was self-employed and had managers and my older sisters to take care of her stores. Over those eight months, my stepfather miraculously learned to walk and talk again, and he came home.

After arriving home, tensions in the family began to rise. My mother was now a full-time caregiver, and my stepfather would not let nonfamily members take care of him, making breaks almost nonexistent for my mom. My three sisters and I, our neighbors, and our grandparents helped as much as we could, but when my stepfather would wake up at 2 a.m., then 3 a.m., then 4 a.m., my mother was always the one telling him he had to go back to sleep. This created an extremely stressful environment for everyone. As my stepfather continued to make strides improving his functionality, he became increasingly frustrated in what he was unable to do. His frustrations turned into impulsive violent episodes. When he would start yelling, my mother would start yelling, and many times the situation would escalate. My mother was also trying to get away from the house as much as possible. She needed a break. She had to remind the person she loved what her name was every single day. She would have to help him transfer out of bed and put his pants on. He could no longer cook; he could no longer pay bills. He was no longer a partner.

As a high-schooler, I didn't always think about the things my mom had to do every day. I was thinking about the amount of time I had to spend with my stepdad. I was thinking about how when I wasn't playing Sorry or Rummy with him, my mom would just sit him in front of the TV. I began to grow frustrated. Ultimately, his violent outbreaks led to

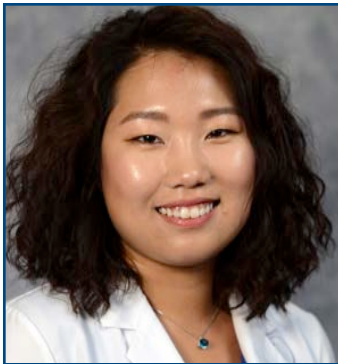
Krista Hoevemeyer

a decision to move him into a long-term care facility. I don't think there has been a time when my mother felt more crushed. She felt she had failed and was abandoning him. She thought others would also think she was abandoning him. At the time, I don't think she fully understood that this was the only way to keep everyone safe and to maintain her own sanity.

My stepfather was home for over two years, and we continuously had care providers coming to our home. I was exposed to many types of care, many mistakes, and many frustrations. I had speech therapists waking me up singing on Saturday mornings. I saw my sisters hunt down and fire a caregiver because she stole things from our home. I also saw many people give shady looks to my mother for bringing my stepfather into the public ladies' room. This led to the realization that an illness or injury does not only impact the individual. It impacts the family, the neighbors, and potentially the entire community.

When I moved away to college, I felt guilt for not being closer to my stepfather. Yet my mind always returns to thinking about what he would want me to do. He would want me to make others' lives better, the way doctors have made his life and my mom's life better. His physicians not only looked out for his well-being, but their words were one of the final pushes that allowed my mother to release him into a care facility. She was drowning, and they could tell. I will be forever grateful to his entire care team, and I hope I will be able to use my medical knowledge and compassion to create a healthier environment for someone else.

CHRISTINA LEE



One of the most important ways to ameliorate quality of life is research. The field of medicine grows and continues to flourish with an ever-expanding amount of knowledge. My experience with research continually reemphasizes the importance of asking the unanswered questions and of the life-long learning that takes place in medicine. The core of osteopathic medicine is providing holistic care for our patients. In order to advocate for better care, it is paramount that we seek better solutions to the quotidian problems we face. Starting with a simple question, research can result

in powerful discoveries that reveal better methods of infection prevention, improved postoperative patient management, novel interventions, and more.

Breast reconstruction is one example in which medicine is improving not only the health but also the quality of life of patients. Statistics show that one in eight American women will develop invasive breast cancer in their lifetime. The projected U.S. incidence of breast cancer in 2017 was approximately 316,120, according to the American Cancer Society. Of these breast-cancer patients, 35 percent to 40 percent will be treated with some form of mastectomy. The literature estimates that anywhere from 17 percent to 42 percent of patients elect postmastectomy breast reconstruction, and this procedure's psychosocial benefits in body image, self-esteem, sexuality, and quality of life are clearly supported by current literature. Most patients and surgeons prefer abdominal-based flap procedures due to superior overall outcomes and satisfaction. However, fewer than 20 percent of surgeons provide microsurgical autologous breast reconstruction.

I began to question why microsurgical autologous breast reconstructions are not being performed by more surgeons despite the high success and satisfaction rate. Kulkarni and colleagues had asked the same question, finding that apparent hindrances include extensive operation duration, labor intensiveness, and challenging dissections. In addition, my extensive literature search failed to reveal detailed descriptive anatomical studies of the internal mammary vessels (IMVs) relative to autologous breast reconstruction. Therefore, I decided to pursue a cadaveric study of the IMVs as they relate to autologous breast reconstruction procedures. It was my hope that an enhanced knowledge of the anatomy of these vessels could serve as an invaluable tool in training surgeons for microsurgical autologous breast reconstructions. The specific goal of my investigation was to obtain reliable measurements and topographic results for the IMVs *in situ*. The study findings offer a dependable method to locate the IMV intraoperatively and establish a safe zone of dissection. The use of the descriptive and qualitative data obtained

from the study could improve patient outcomes in autologous breast reconstruction by reducing intraoperative vascular compromise. Equipping surgeons with a reliable zone of dissection for recipient vessel exposure may decrease patient morbidity in autologous breast reconstructions.

In the past year, I was selected to be an anatomy fellow at my institution, where I completed courses for a master's degree in clinical research in anatomy and taught first- and second-year medical students in gross anatomy laboratory and in lecture halls. This teaching experience led me to new projects exploring nontraditional methods of enhancing medical education, especially for students with specific interests in pursuing surgical specialties. Part of the fellowship training required us to complete a course in which we performed mock surgeries on cadavers. We were able to practice advance suturing and surgical instrumentation, including laparoscopy. Anecdotally, this course prepared me to excel tremendously for my surgical clerkship. I began to wonder about ways to enhance clinical anatomy education in conjunction with traditional gross anatomy education. In clerkships, we mostly encounter anatomy in limited perspectives during minimally invasive procedures. If we could teach and expose pre-clerkship students to common procedures, such as laparoscopy and endoscopy, they could better focus on applying basic scientific knowledge and on learning the new clinical wisdoms, rather than being distracted by relearning old material. My research assessed possible benefits of providing pre-clerkship procedural exposure for second-year medical students. I was selected for a presentation in the medical student program at the Clinical Congress for the American College of Surgery.

As a future osteopathic physician, my goal is to continue asking the unanswered questions, whether it is for patients or for medical professionals. The projects I pursue will be dependent on the field I enter, but my passion for, and dedication to contribute to, medicine in order to enhance our care and teaching will persist. As long as there is a limitless potential and wealth of knowledge to be discovered, it is our duty to pursue the paths that will lead to those discoveries.

TAYLOR BROWN

O rthopedic surgery has the great potential to improve quality of life by focusing on the restoration of patients' function and strength. During my anatomy fellowship year, I conducted research assessing the repair of distal biceps tendon ruptures, which allowed me to address the anatomical and physical complications following the procedure while encouraging patient-centered care. The distal biceps tendon is typically ruptured in middle-aged males during eccentric contraction of the biceps muscle. This population tends to include athletes and heavy labor-

ers—people who wish to return to function quickly and effectively. A surgical technique allows patients to quickly return to work and activity with maintained strength of the repaired tendon. However, up to 20 percent of patients can experience transient or persistent nerve damage following the procedure. The nerve complications can have a great impact on quality of life.

In my research, I used cadavers to assess the anatomical relationships involved in the surgical procedure. The current standard of care approaches the surgical zone at an angle of 30 degrees toward the ulna, which creates a safe distance between the guidewire and the posterior interosseous nerve. If this nerve is injured, the patient can experience significant motor deficits, limiting the ability to extend the wrist and digits. While extensive research has addressed the safest angle of approach to avoid injury to the posterior interosseous nerve, it is not known if the same angle is protective for the two other nerves within the surgical zone, the median nerve and superficial radial nerve. Initially, we sought to validate the current standard of care in its ability to create a safe repair in relation to all three nerves. However, while measuring the distances from all three nerves to a guidewire placed at the standardized angle, it was determined that the greatest, and thus safest, distance from the nerves to the guidewire would necessitate a change in angle trajectory to 45 degrees toward the ulna.

It was then important to determine if the change in angle would create a repair that was comparable in strength to the current standard of care. In partnership with the engineering department at University of Missouri-Kansas City, we assessed the pullout strength of both the 30-degree and 45-degree angles of approach using a fresh cadaveric specimen. Following tensile testing, it was found that there was no statistically significant difference between the two repair angles. We concluded that the alternate angle of approach, aimed 45 degrees toward the ulna, would accomplish our two goals: maintain

Taylor Brown

the strength and functionality of the repair, and decrease the risk of injury to the three nerves within the cubital fossa.

Although there is still more work to be done to ensure that the revised method would be the best option for patients, I have learned the importance of returning to our foundational knowledge when considering methods to decrease structural complications during surgery. I became passionate about this research because it considers the patient's goals and quality of life following surgery. This resonates with the philosophy of osteopathic medicine by not simply focusing on the patient's symptoms at the moment of surgery, but rather understanding the impact of the injury on people's lives beyond the physician-patient encounter. I find it exciting and encouraging that the rate of research on emerging technology for conservative and operative management provides a promising outlook for continuously improving treatment regimens. A diversity of treatment opportunities allows patients to consider options with their individual goals in mind. As a future osteopathic physician, I aim to continue recognizing opportunities for improvement in patient care and to pursue solutions through research.

KYLE YUQUIMPO



Research has been integral to my current career as a future osteopathic physician. During my time as an undergraduate student, I had the opportunity to concurrently conduct basic science research and volunteer with the Crohn's and Colitis Foundation (CCF). This opportunity became a pivotal experience for me in understanding the importance of research. Because of the time I spent with patients with inflammatory bowel disease patients and their families, working with the CCFA became a catalyst to not only continue as a scientist but to also act as a patient advocate. This

humanistic drive behind my motivation resonated impressively with the tenants of osteopathic medicine. Within the methodical and step-wise nature of research, an understanding and respect of the human spirit is necessary for healing. Truly, acquiring this insight attracted me to pursuing a career in osteopathic medicine.

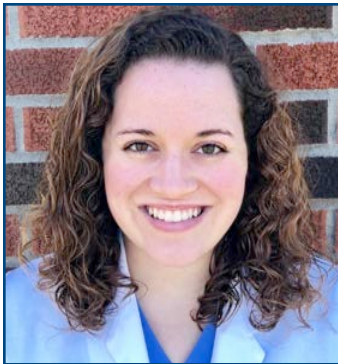
Time is an important element to the progress of a researcher. There are increasingly new techniques to be learned as well as new trial results to interpret. Over the past few years, I have had remarkable opportunities to work with well-versed mentors who have pressed me to become wiser by becoming more critical of my own mental processing within the scientific method. I have been intrigued by the arduous pathway taken to present what is known as common knowledge in the preclinical medical curriculum. Having such a curiosity has expanded my skill set as a researcher and complemented the information base I have gained thus far in medical school. As a predoctoral research fellow, I've been given the opportunity to further improve my research capacities before completing medical school. This experience has been nothing short of beneficial as it has removed self-created boundaries on my work ethic and given me perseverance to trudge through negative results, small sample sizes, and analytical models that never make sense to me. It has driven me to continuously evaluate and better understand my potential niche as a prospective clinician-scientist.

There is an excitement to the future as I look to advancing myself through residency, fellowship, and other opportunities. I hope to enter an osteopathic-recognized internal medicine residency and to have colleagues and faculty provide perspectives and insight that will supplement my unique medical training. I would like to pursue a career as an academic physician who utilizes my research acumen to benefit my clinician and scientific colleagues and—most importantly—my patients. The opportunity to trail-blaze methods of collaborative research across multiple topics, such as osteopathic manipulative medicine and the gut microbiome, is another opportunity I wish to explore in the

Kyle Yuquimpo

future. Furthermore, I would like to play a role in the development of research strategies and advancement in osteopathic residency programs and medical schools, whether as a program director or an integral member of the Commission on Osteopathic College Accreditation.

CARYN LAWRENCE



Without research, modern medicine would not exist. As a medical student and future physician, it is important that I understand how research studies are funded, conducted, and published. Without this knowledge, I will not be able to provide the best possible care for my patients. Prior to medical school, I worked for nearly two years as a research microbiologist at Applied Research Associates, Inc., on a Food and Drug Administration (FDA) -funded study. My primary research focus was investigating the decontamination and reuse of respirators during an influenza

pandemic. The study was divided into two parts: evaluating the decontamination and reuse of disposable N95 respirators (currently used in hospitals) with ultraviolet C (UV-C) light, and also evaluating the manual cleaning and disinfection of reusable half-mask elastomeric respirators (HMERs) (currently not FDA-approved for use in hospitals).

One of my colleagues spearheaded the N95 respirator component, while I was primarily responsible for the HMER portion. We were both involved in all aspects of the study, including lab work, data analysis, and troubleshooting. After evaluating the efficacy of inactivating or removing the H1N1 influenza virus from the respirators, we conducted durability testing at the National Institute of Occupational Safety and Health (NIOSH) labs in Pittsburgh, Pennsylvania. That testing was designed to ensure that the UV treatment for the N95 respirators and the cleaning methods for the HMERs did not affect the integrity of the devices after many treatments. An additional study was conducted evaluating the effectiveness of automated cleaning on HMERs using a hospital washer. During my employment, I spent the majority of my time in the microbiology lab maintaining cell cultures and conducting tests with the influenza virus on our respirators. The remainder of my time was spent writing reports, analyzing data, and researching methods for future portions of the study. Just before I left my job to begin medical school, I was able to present a poster on my research at the American Society for Microbiology conference in June 2016. I am still in close contact with my principal investigator and former supervisor, as we are in the process of publishing papers.

The experience I gained from this job was invaluable. I not only became familiar with the process of conducting research and publishing in a peer-reviewed journal, but my knowledge of public health grew substantially throughout this experience and will be invaluable in my future career. As an aspiring emergency medicine physician, I may be one of the first health care professionals involved at the beginning of a pandemic. It is of the utmost importance that health care workers remain healthy during a pandemic

Caryn Lawrence

and care for those who are sick. I have extensive knowledge about respirators that can be effectively decontaminated for reuse during an influenza outbreak. The question is not if, but when, there will be a need for this knowledge. Even in the early part of the 2009 H1N1 influenza pandemic, there was a shortage of N95 respirators. Further research into the stockpiling and reuse of personal protective equipment for health crises remains an important topic for public health.

In the future, I am uncertain if I will continue public health research or if my interests will lie within clinical research, but I do know that research is the backbone of medicine and so very important for progression of new ideas and innovation. As a dual-degree student also pursuing a master's degree in bioethics, there are many ways that I can integrate bioethics into my public health and clinical interests. I hope one day to work for a research-based institute, so I am able to further pursue my research interests while also caring for patients.

ADRIANNA DARWISH



I was selected as one of six students to be an undergraduate osteopathic manipulative medicine (OMM) fellow at Kansas City University (KCU). This fellowship gave me the unique opportunity to teach medical school students in both clinical and osteopathic areas of focus, and it also allowed me to improve my own OMM skills. During that year, I had to be fully engaged with my school and my students and with the osteopathic profession as a whole. I spent over 500 hours teaching students who were in their first three years of medical schooling. I educated the students on the importance of

osteopathic medicine and the application of osteopathic principals in everyday situations and as future physicians. It was during this time that I found my passion for osteopathic medicine and for teaching those around me.

This experience made a huge impact on my life and on my practice as a future physician. We use OMM to look at the body in a holistic manner and to provide other treatment options in addition to traditional medication regimens. Osteopathic principles have allowed me to view my patients and medicine with a more holistic approach. It is important to consider the whole picture when evaluating patients and to realize that patients are more than just numbers or diagnoses. I plan to use my improved osteopathic manipulative skills on my patients in the future. I will be entering the field of obstetrics and gynecology, in which I can use manipulation for antepartum and postpartum pain/discomfort, as well as for pelvic pain. Using manipulation in addition to other modern medical treatments can aid patients through decreasing pain and increasing quality of life.

Along with allowing me to learn a more holistic approach, the fellowship enabled me to work on and improve my teaching abilities. I obtained the unique opportunity to teach hundreds of osteopathic medical students during my fellowship and was able to try different teaching techniques. I plan to use all of my acquired teaching skills to not only educate medical students, staff, and peers, but also to educate my patients. I believe that patient education is extremely important in medicine and that physicians' communication with patients can either make or break the physician-patient interaction. It is crucial to be able to explain things to patients in terms that they understand and are familiar with, so that they are able to make the most educated decisions for themselves.

Overall, my year as an undergraduate OMM fellow at KCU was a wonderful and life-altering experience. I plan to use all of my new-found knowledge and experience to continue to improve my patient-care skills and grow as a future physician.

JAMES DOLBOW



First and foremost, I need to state that everything I have accomplished in research is due to the help and hard work of those I have had the good fortune to work with. I have been more blessed than I can describe to have been welcomed into the research labs and universities in which I have worked and studied. However, the patients and study participants I have had the honor and privilege to work with are the people who have most shaped both myself and my research in physical medicine and rehabilitation. Without their participation and hard work, I would not be where I am today,

nor would my research.

Many years ago, during my medical research internship at the Veterans Administration Medical Center in Richmond, Virginia, I fell in love with the special patient population of individuals with spinal cord injury and paralysis. Their hard work and perseverance challenged me to work harder at answering many of my research questions. My passion and my research revolve around gait and motor-function restoration. Over the past five years, this passion has pushed me to publish 10 manuscripts on this patient population, with five more currently in peer review or editing. Additionally, I have presented my research at local, state, national, and international medical conferences in both lecture and poster format. I am only now, in the past two years, beginning to see the impact of my research. I have been honored to receive award presentations and speaking engagements about my research in physical medicine; two of those research studies are specific to osteopathic medicine. I have gratefully found that my unique perspective on optimizing the gait and motor-restoration process after paralysis has been well received at medical conferences. The warm welcome I have received in the research community concerning my presentations and manuscripts has encouraged me to further my research goals into residency and, more importantly, into my osteopathic medical career.

My research thus far has aimed to optimize gait and motor-restoration modalities, techniques, and protocols for patients affected by paralysis. Osteopathic principles are foundational to my research, which is designed to work with the power of the body in naturally healing itself and to help improve the quality of life of those less fortunate. I am firm in my resolve to continue as I have begun, to seek to optimize the conditions and modalities in which the body can naturally recover. I seek to find modalities that best improve function through neuroplasticity after central nervous system injury, with special attention focused on the restoration of the gait pattern and motor recovery. I have also extended this research concept into similar studies in pediatrics and neurodegenerative

James Dolbow

disease. My recent research (currently in peer review) regards optimization of the psychological state of these patients after paralysis and traumatic brain injury. I have been awarded a research fellowship at LMU-DCOM that focuses on public/community health and patient empowerment in these populations. Once again, none of this would have been possible, nor accomplished, without the help and hard work of incredible research assistants, mentors, and, most of all, study participants.

Incorporating my research into an osteopathic medical practice is at the forefront of my goals, as improving the natural structure-function relationship of the human body is one of the cornerstones of osteopathic medicine. Prior to entering medical school, I worked as an aquatic personal trainer for the disabled population. In that role, I was able to see firsthand the challenges and successes of implementing research into practice. I believe continued investigation into the efficacy of existing technologies is of the upmost importance, and such research is an activity in which I will participate throughout my career in osteopathic medicine. I seek to investigate and develop novel therapies that can ultimately be integrated in each community. I have been blessed that the people surrounding me have empowered me my entire life. My research will advance the blessing so that I may help empower patients to improve their physical autonomy. This is both the foundational motivation and ultimate goal for incorporating my research into my future osteopathic medical practice.

AARON KUZEL



The core value of the osteopathic philosophy is service, whether it is service to the nation, service to the community, or especially service to our fellow humans. As a future osteopathic physician, it is my intent to serve not only in the Uniformed Services, but to serve those in need in the local community and those who lack adequate medical services abroad. As medical students, we are well aware that time is a precious resource and that we don't have enough of it in the day. But it is the time we spend in meaningful service to those in need that defines a true osteopathic physician.

One of the greatest privileges I've had in medical school is the opportunity to teach not only my colleagues, but those most crucial to our community's infrastructure. By the end of my first year of medical school, I was certified as an American Heart Association cardiopulmonary resuscitation (AHA CPR) instructor. As a former emergency medical technician (EMT), I was very familiar with bad training, and I knew that bad training is expensive, not monetarily, but in lives. When I was a brand new EMT, I was eager and enthusiastic but not confident in my abilities, even though I carried all the correct certifications. One evening, our patient progressed into cardiac arrest. I was clumsy and in a panic and unable to perform my duties. My partner had to assume the role of a single provider as I had become a bystander. Instead of preparing the drugs and IV access, he was doing my job. I didn't take responsibility for my training. I didn't seek guidance when I knew I wasn't prepared, and that cost a patient valuable minutes. That experience certainly made an impact on me, and I vowed not to repeat those mistakes in my own performance or in the performance of the individuals I would later mentor.

The Lincoln Memorial University–DeBusk College of Osteopathic Medicine (LMU-DCOM) has an excellent basic life support (BLS) program that not only caters to the medical students, but also supports the local community. I am humbled that I was able to serve as an instructor to my colleagues and, more importantly, to teachers, EMTs, and firefighters. A substantial portion of my summer was spent driving with a faculty member between the several primary and secondary schools in Lee, Claiborne, and Bell counties in Tennessee. During our training sessions, I made sure that every single student was equipped to handle any situation and that they could do CPR without thinking. I was methodical, but compassionate. I took the time to field any questions that any of the teachers had, because I wanted to make sure that if a child went into cardiac arrest, these teachers were confident in their abilities. I spent extra time, even outside the course, to make sure that my students were ready for any tragedy. I ensured that they could use the

Aaron Kuzel

automated external defibrillators confidently and that they could recite the steps. I never wanted for them to experience what happened to me— that guilt, that painful regret.

While assisting teachers to learn CPR is good for the students and school system, I especially enjoyed training nursing students and first responders in BLS. These are the members of the community who were going to be challenged by events every day and whom I would be calling colleagues in the near future. If I could better serve these young men and women, then they could better serve their patients and, therefore, make a larger impact in their communities throughout the course of their careers. Taking the time to instruct these teachers, first responders, and students required a lot of effort and time during a very trying second year of medical school. However, each minute spent making sure that these individuals are confident and precise in their training will impact the local and medical communities for years.

To be a strong osteopathic physician, one chooses to sacrifice their time for the improvement of the community; it is to choose what is right, rather than what is convenient. As a future physician and as a member of a health care team, it is our job to lift those around us and encourage them to strive for better performance. When I am a physician, I will always be committed to training and helping those around me. We must strive diligently to support the next generation of health care workers, from the medical students to the EMTs. This is the philosophy I subscribe to, and it has been put to the test in my service as an EMT and as an employee at Quantico. I will always carry this philosophy with me as an osteopathic physician.

AUSTEN NELSON



“Who gave me permission to do this?” I thought to myself as I wiped snot and tears from my face, standing in the Transportation Security Administration line at the airport after hugging my dad goodbye. “Who said you can get on a plane to live in another country without anyone else’s approval?” I did. About a year earlier, I had decided I was ready for a change from the monotony that had become my day-to-day office job, working toward someone else’s goals. So I put on my big-girl pants and applied to the Peace Corps.

I was living my dream—that far-fetched bucket-list “one-day-I-want-to” dream. It was the first time I had lived more than a three-hour drive from my family, but little did I know that the host families that took me in would love me as their own. I had never developed my own work; I always had a boss dictating what needed to be done. But with this program, I was empowered to act with and for my community to develop sustainable resources that would last long after my service. I had never felt threatened or different in my home in Southern California, but in the depths of the pineapple fields of Costa Rica, I was the first blonde that many of my students and other local people had ever seen. It was common for people to play with my hair on the bus or street corners. I learned to travel alone. I tried to understand the best way to communicate with a culture with sometimes very different values. I began to understand that I will never know enough.

Through every challenge, I became closer to who I envisioned myself: more alert, more attuned, and better equipped to adjust as needed. I decided my motto was, “cultivating resilience.” When a school principal wasn’t convinced I was qualified to teach, when the high-school boys whistled at me in and out of the classroom, when my region had the highest rate of teenage pregnancy but students were only taught abstinence, when I got calls from family in the United States who were in the hospital, and when I desperately missed home, I was cultivating resilience.

Medicine and medical school have mirrored those challenges. I’m already in the third year of medical school and I still can’t believe I’m here. These aspirations always seemed so far-fetched. The Southern hospitality of rural Tennessee was thrust upon me full-force the first time I got sick, and peers and staff from my medical school took as good care of me as had my Latina host moms in Costa Rica. I developed my own schedule, determining how much time would be spent studying, volunteering, and focusing on personal care. My occasional enthusiasm for fall colors and yoga and my naiveté of snow and “BBQ” versus “cookout” betrayed my roots to locals. “You ain’t from ‘round

Austen Nelson

here, are ya?” And oh boy, did the challenges come: exam scores that didn’t reflect my study efforts, feeling like an idiot in front of professors or preceptors, having back-to-back exam weeks fueled on caffeine and vending-machine snacks, my own health being in jeopardy, and losing the grandparents who had inspired my heart and backbone. Resilience was a necessity.

It’s taken determination, more setbacks than I can count, and a whole lot of grace to get me here, but I am here. The first two years of school felt like I was constantly tripping and catching myself mid-fall. But I’ve become adept at bouncing back, and with the support of loved ones, I can see beyond my limitations and move onto the next phase. Third year has already brought its own challenges, but as I have proven time and time again, mostly to myself more than anyone else, I’m capable. The only person I need permission from to dream big is me, and I don’t plan on leaving anything on my bucket list.

SHAY COLLINS



When I began medical school, my fiancé and son had to adjust, just as I did, not only to my schedule, but also to a smaller rural environment. It was very difficult for all of us. I began to look for a Head Start program for my three-year-old son, Dylan, because I noticed that his speech was not progressing well. He attended speech therapy through the end of my first year. It was then that I sat in on a speech-therapy session, and the therapist mentioned to me, “I think your son has autism.” I wasn’t sure how to react. All I wanted was to start medical school, but here I was confronted

with a serious unexpected problem. What do I do? Where do I start? I began to research what resources were in the area to have my son tested. I reached out to my professors and close friends at school. Gratefully, without my prior knowledge, Dr. Morgan, my colleague, hosted a fundraiser at our school and surprised my son with an iPad for Christmas to help develop his speech. From what I learned about autism, individuals have better results when they receive the testing and resources they need early. Because we lived in a small rural town, a lot of the testing was over an hour away.

After getting my son in school and seeing a psychologist, in addition to the speech therapist three times a week, I adjusted to the new schedule while my fiancé was working in town. As I began my second year of medical school, I began to balance all things with my family and with Dylan having autism spectrum disorder. But then my fiancé started to have pain in his hip and problems with walking. During a period of several doctor’s visits and diagnostic tests, he was repeatedly told he had sciatica, and he was prescribed lots of pain medications. However, an orthopedic doctor finally ordered an MRI. After seeing the results, he told my fiancé, “You need a hip replacement.” My head dropped. After the diagnosis, we tried to schedule a surgery date during one of my breaks. But then my fiancé, DeBorian, developed a recurring foot infection that was treated for several months. So I spent my entire second year of medical school in hospitals and doctors’ offices more than in the classroom. I had to watch all my lectures from recordings, no matter where I was. The hip surgery was scheduled at the end of my second year.

We then moved to my rotation site, which was much closer to home. It was important to move near family because we had endured so much without much help. During this time, I was preparing to start my rotations when the unthinkable occurred. My son developed osteomyelitis in one of his facial bones. During his hospital stay, there was an incidental finding on one of his cranial bones. A member of the hematology/oncology team said, “We think your son may have cancer.” I had to take a big step back. I am trying

Shay Collins

to remain strong for myself so I can raise and take care of my son. But why can't I catch a break? As I gathered myself, I had to take a leave of absence from school to tend to my son and figure out how to approach this. After all this, my fiancé was able to get back to work, but he had to get his other hip replaced later that year, when I started rotations. During that time, my faith wavered and I constantly battled myself, wondering if I could handle the life of a physician and if life was meant to be like this for me. I prayed and asked for guidance, trying to trust that things would be okay. Sometimes God knows how to send the right people in your life and give you the right words to use. It is because of my fiancé, parents, grandmothers, siblings, aunts, uncles, cousins, and extended family and loved ones that I am reminded, "I can do all things through Christ who strengthens me" – Philippians 4:13.

After taking a leave of absence, I started with my clinical rotations. I loved working with people and getting to know more about clinical medicine, building upon the foundation I developed from case studies and textbooks. It was a whole new world. One thing I am passionate about is advocating for those who cannot advocate for themselves. As a young girl, I saw my grandmother take 20 pills a day, and she struggled with health problems until her passing. Observing the way my son was treated when I was told he might have cancer was terrifying. And dealing with my own health issues was troubling as well. When you don't have that one person to assist in coordinating care after seeing so many specialists, it can be overwhelming, terrifying, and frustrating.

On September 18, 2016, I was sitting on the couch reading. All of a sudden, I noticed a hand moving all over my lap. I began to think my son was playing a joke, but he wasn't around. No one was around me. To ease my mind, I moved to the bedroom, where DeBorian was watching television. Without any mention of what I had experienced, I sat down. There it was again! To my surprise, it was my hand but it wasn't attached to my body! It just laid there and I couldn't make sense of it, so I yelled out, "Do you see it? Do you see my hand lying there?" My fiancé asked, "Why are you talking like that?" Immediately I heard myself echoing. What I heard myself speaking was slightly delayed. DeBorian told me that my speech was slurred. Without a thought, I went to a mirror to run through a cranial nerve examination. I was so nervous that I was hesitant about going to the ER because I didn't know if I was just stressed out, considering it was my fourth year and I was dealing with so many other problems. My fiancé called family members and after hearing from them, I knew I needed to go. As I reached for my purse, I couldn't make my hand go where I wanted it to go. When I got to the ER, the neurologist told me, "Ms. Collins, you had a stroke."

After finding out that my right internal carotid artery was completely blocked from an arterial dissection, it was recommended that I follow-up with neurology. I had aggravating pain in my neck, and I was told, "You will probably have this pain forever." After that, my parents drove from Louisiana to see me. They decided to take me to the hospital at the University of Alabama at Birmingham for a second opinion. There, the doctors confirmed my stroke, and I was admitted into the hospital. They then discovered

Shay Collins

two more dissections, in both vertebral arteries in my neck. After my treatment, during physical therapy, I continued having complications with my blood pressure and seizure episodes. The team concluded that it was vital to transfer me to the rehabilitation unit. From there, I stayed a few more weeks until I was discharged and able to return back home to my home, which was four hours away.

After I was discharged, I continued to follow-up with my specialists, searching for answers. I attended physical and occupational therapy sessions near my home, so I could stay with my fiancé and son after weeks of being away from them. Furthermore, following months of struggles with my health and that of my family, I wanted to get back in the office, because I felt like I was withering away physically, but even more so mentally. I felt like everything I had learned from medical school was lost. I had difficulty reading print, because it made me dizzy. Watching crowds moving in public places led to visual problems, nausea, and other overwhelming symptoms. It has been agony knowing that in my fourth year of medical school, I am going through all this instead of preparing to be a resident intern physician. Will my colleagues and patients trust me? Do I trust myself?

Currently, I am being referred to an Undiagnosed Diseases Program for further evaluation and testing. I am being told that I have a rare genetic disorder that is causing my arteries to tear, and I have to remain on blood thinners for the rest of my life. At times, my faith still wavers, and I wonder how I can ever move forward if obstacles so huge always block me from my dreams, from helping others, and from taking care of my family. I know in life there are disappointments, like losing my grandmother who raised me and my mother-in-law in the past two years. Or watching my youngest sister's home burn down, the home that our grandmother left for her and her family. Nevertheless, because of the pain and the stress I feel when I go through these ordeals, I do not want to fail. I want to prevail! I have to accept that I am not perfect. BUT I AM A SURVIVOR! I have struggled since age 10, helping to care for my family as the eldest of four children from a single male-parent household. My circumstances do not define me. Rather, they have made me more resilient, empathetic, and personable when caring for others, and I am striving to become the best physician I can for my patients. One thing is for sure, my past has shaped me into the woman I am today—dedicated, dependable, and determined.

ZURI HUDSON



July 14, 2016, was the day I lost my first patient: my dad.

My dad was diagnosed with scleroderma in 2012, while I was pursuing my undergraduate degree. The illness climaxed during my first year of medical school. Scleroderma, or systemic sclerosis, is characteristically seen as tightening of the skin; cold, discolored fingers and toes; numbness; and respiratory distress, with death stemming from renal failure, heart failure, or both. My dad's illness was straight out of the textbook, and his journey drives me as a medical student and future osteopathic physician. He labelled himself my "first patient"—always keeping me informed of his ever-expanding lists of medications, chemotherapy transfusion schedules, scleroderma drug trials and research, and doctor appointments. The joy he had in knowing that one day I will have an impact as a physician kept him going, and that is what drives my love, compassion, and service in the medical field.

I've been a daddy's girl my whole life. I have so many fond memories of playing with his ears or holding his hand or leg or simply resting a hand on him always. My dad is where I first learned the power of touch, the importance of serving the community selflessly, walking by faith, and being a light wherever you go. I could talk for days about all the experiences we had through the years, but I think what's more important is what my dad put back into the world. He was someone who was known for going above and beyond, no matter who was watching. He didn't do anything for the spotlight or recognition; he just wanted to genuinely and whole-heartedly serve others. I hope I can demonstrate even an ounce of his dedication, courage, and genuine care as I live my life and work in the field of osteopathic medicine.

Walking into my first classes of second year, two weeks after my father's death, is something I'll never forget. This was the moment I broke down. I realized, for the first time, that I have never fully understood mental health and the necessity of self-care. I had to admit my weakness, be vulnerable, and seek help. I knew I would need a social-support system to physically help me through the next three years of my education. This was also the moment I realized I was just where I was meant to be.

As I navigate the grief process while in medical school, I have learned to treasure taking time for myself as well as putting faith in people around me who uplift me when I can't see I'm fading. As medical students, we are infamous for putting ourselves last — myself included! We will all face adversity during our medical training. It is essential that

Zuri Hudson

we make sure that, no matter our circumstances, we appreciate each step in the journey, take time to tap into our core passions, and remind ourselves of the reasons we are pursuing medicine.

Although It has taken me time to get to where I am today, I am thankful for the ways my dad's life has enriched my life and contributed to my medical career. My dad epitomized traits that I long to emulate as an osteopathic medical student and physician—service, humility, and genuine care for his neighbors. My journey through this year has been one of faith, resilience, and humility, and I wouldn't change it for the world.

CHRISTOPHER KORDICK



As osteopathic physicians, we are taught to engage barriers, push physiological boundaries, and utilize our senses in ways other physicians do not. Treating patients with osteopathic manipulative treatment requires full engagement of your senses, your spirit, and your knowledge; anything less and the benefit of treatment dwindles. I would like to share a personal story of a bond I had made with a patient on an osteopathic manipulative medicine (OMM) rotation. I will call her Joy.

I had been working with a prominent OMM-practicing physician in the Erie community when I met Joy. She was struck by a vehicle, leaving her with multiple broken bones as well as lesions to her cerebellum. These lesions left her with terrible muscle spasms and poor motor control, restricting her daily function and limiting her to a wheelchair. Given her situation, I expected to meet a somewhat downtrodden individual when I entered the treatment room. To my surprise, however, she was rather full of life, and her presence lit up the room.

The rest of the week, I was fully engaged in her case. I researched various treatment techniques, reviewed specific anatomy relevant to her dysfunction, and discussed innovative treatment ideas with my attending. I knew we could make a difference. Each week brought another visit and further progress. Slowly, my attending and I started to notice improvements in her condition. She began sitting easier, had more success at her physical therapy, and showed less dysfunction.

The weeks of the rotation flew by, and the last visit was melancholy. When she told us she would see us within the next week, I had to explain that I would be moving to a new location to begin a new rotation. We were both sad to part ways, but she understood. I, however, felt compelled to do more. At this point, I was fully engaged in her will to recover and amazed by the success she had thus far shown. At the end of the day, I discussed the possibility of me coming back to treat her outside of regular hours, and my attending was in full support.

My attending and I decided to volunteer our time on Saturdays so that we could treat Joy. Each visit brought new breakthroughs for her. After the first weekend visit, she could walk a few steps from the treatment table to her wheelchair—something she had not done in years. As we continued to treat her, we continued to see progress, as did she.

Through my experience working with Joy, I conceived my philosophy for my future practice of osteopathic medicine. This experience taught me that I must be fully attentive to the social, spiritual, and physical needs of my patients. Joy has taught me to never

Christopher Kordick

anticipate the outlook of patients based on their problems, but rather to get to know their stories. Joy has also reaffirmed my passion for OMM. I firmly believe that the hands of an OMM practitioner are the most valuable tools in medicine. I have learned to further polish my OMM skills and utilize my natural abilities to help facilitate healing in others. Establishing a firm belief in these principles, I believe that I can continue to make a difference in both my local community and the osteopathic medical profession.

MARIE COSETTE GABRIEL



There have been so many moments throughout medical school that have given me pause. Pause in thanksgiving for how far I had come and what it had taken to get here. Pause in fear for how far I had yet to travel on this journey. And pause in silence at all the times when I was left speechless, thoughtless, and humbled by the people I would one day be serving in my osteopathic medical profession.

I was a second-year medical student when my classmate and I were approached by a school administrator to give one-hour lectures to high-school students. The lectures were part of Florida's Sexual Health Education Community Outreach Tool Kit, called "It's Your Choice." This program focused on behavioral-skills development, reduction of risky behaviors, self-esteem promotion, pregnancy prevention, and education on sexually transmitted disease. My classmate (president of the Women's Health Club) and I (president of the Pediatrics Club) looked at each other with hesitation as we weighed the time commitment and how it would affect our study schedules. Still, we shrugged our shoulders in agreement, thinking that this task would be fun, easy, and straight-forward enough. It was as if the task was just another item to check off our list of things to do—a favor we were doing for our professor and an activity for our club members to participate in, but an obstacle to boards studying.

I took on the first lecture of the day. I stood in front of the high-school students and noticed their lack of enthusiasm. They were a sea of expressionless faces. But I also had several other things going through my head, such as where I would get food after this, how busy the library would be when I finished, and how many chapters I had to read that night. I flipped through my prepared PowerPoint slides, explaining the different types of contraception and how important it is to respect your body. I felt prepared to answer any questions they might have about the reproductive system. Then someone raised her hand. "Can you get pregnant from swallowing semen?" I paused. My cheeks started to heat up as I heard some snickers around the room, but when I looked at the young female who had asked the question, her expression was serious, with an air of anxiety as she anticipated my reply. That was when I shut off the running stream of thoughts going through my head, the endless to-do list. I began to explain to her that the gastrointestinal and reproductive tracts were separate systems that didn't have any direct communication. I told her that what was present in our gut lumen could be thought of as outside of our body.

Marie Cosette Gabriel

Then more questions came. “Then how come my belly hurts when I have my period?” “What’s a lumen?” My answers became more and more cumbersome, as I realized how little they understood about their anatomy and how difficult it can be to describe. I felt jolted into action, realizing that I needed to be fully engaged with these students in order to deliver this presentation and answer their questions. Surely, I wanted all the things this program had promised for these students, including an understanding of sexual health, prevention of unplanned and unwanted pregnancy, and reduction of risky behaviors. Yet in order to approach these goals, I needed to be fully present in the moment, dedicating my focus to these students. I struggled through that first lecture, but as the day went on, it became evident that these students needed and wanted this presentation. By shutting off my stream of thoughts and being fully engaged with the students, I became better able to be their health educator and health advocate.

As a future physician, I hope to always remember to pause. Taking a pause, scheduled or not, has always helped me to reset and refocus my mind on the present. With such pauses, I am reminded to become fully engaged with my patients, switching the focus from my own needs and thoughts to theirs. Through these pauses, I am reminded to address their chief complaints, to make them feel comfortable, to educate them, and to empathize with them.

STACEY MAIN



Throughout my life, I have encountered many experiences that have provided me with the drive and desire to pursue a career in research and medicine. As a child, I faced the hardship of nearly losing my father to an automobile accident. He survived months in a coma, but with many broken bones and a traumatic brain injury that robbed him of many memories. For an entire year, his home was a brain rehabilitation center. I watched him day after day struggle with things that most of us take for granted. This experience sprouted my curiosity as to how the brain functioned.

Everything that makes you an individual is intricately mapped in your brain. From that moment on, I was fascinated by neurological functioning. Thus, my journey into research and medicine began.

As an undergraduate student, I began doing research on the physiological processes of mitophagy at the Biomolecular Research Annex at the University of Central Florida. We investigated the dysregulation of mitophagy and how it plays a role in motor neuron diseases with Parkinsonian phenotypes and neurodegeneration. Our data provided us with a likely mechanism of mitophagy, which may function similarly to pathways involved in Parkinson disease. Discovering a probable insight as to how these mechanisms parallel may contribute to the fine-tuning of treatment options or even measures in prevention.

I am currently a second-year medical student at Lake Erie College of Osteopathic Medicine. I have participated in projects dealing with the effects of monosodium glutamate on the cerebellar Purkinje cells, as well as this compound's effects in neonatal exposure and dysmorphology of lower motor neurons. Our data showed a significant decrease in Purkinje cells and motor coordination following exposure to monosodium glutamate. These results may shine light onto particular environmental agents that cause deleterious effects on neurological function.

My most recent project is about repeated prenatal exposure to valproic acid (VPA) and its effects on cerebellar structure and function. Valproic acid is commonly used in research to produce an animal model that emulates the quantitative neuronal changes seen in humans with autism spectrum disorder (ASD). Purkinje cells are a major cell type in the cerebellar cortex, and dysfunction of these neurons likely contribute to motor deficiencies in individuals with ASD. Herein, we utilized a VPA-exposure model of ASD to identify a relationship between cerebellar dysmorphology and motor dysfunction. Our data, which demonstrate a clear connection between disruptions in cerebellar structure and poor motor coordination, represent a necessary step in developing strategies

Stacey Main

to better cope with this increasingly prevalent disorder. We have begun collecting preliminary data for an anticipated project in 2018, which will be focused on understanding the connection between neonatal injury of the cerebellum and ASD, and ameliorating motor disturbances through the use of sensory and environmental enrichment therapy. This project has a tremendous potential to positively impact a wide range of patients with ASD. Our preliminary data suggest a positive correlation between therapy and the reversal of physical limitations. This research may aid in exciting new treatment options.

As a future osteopathic physician, I would like to continue performing research through clinical observation of enrichment therapy on neurodevelopmental disorders. Ultimately, I'd like to open a neurological facility that incorporates traditional rehabilitation as well as new cutting-edge options. It's been many years since I was first inspired as a child through unfortunate circumstances, and yet my curiosity and love for understanding more about our neurological physiology has not changed. I believe it's imperative to be an active participant in research as a physician, because this allows you to be more proficient and current in finding the best treatment options available for your patients.

DREW CHARLES



Robert Heinlein’s quote, “when one teaches, two learn,” could not be a more accurate reflection of my medical education. Hosting my first tutoring session at Liberty University College of Osteopathic Medicine (LUCOM) overwhelmed my nerves. I spent hours engulfed in the material, yet I still felt unsure of how the session would go. Much to my surprise, when the session came to an end, students commended me on my teaching style. I thought to myself that they were just being kind. However, much to my excitement, attendance with each session increased. I realized I had the

potential to make a lasting impact among the students and to be a catalyst in instilling the power and joy of lifelong learning.

I vividly recall the day that a position for a graduate teaching fellow opened. With this opportunity, I knew I could impact students in a teaching environment. Being the first student offered this position, I had mixed emotions, knowing that I could be subjected to much scrutiny but that there would be room to continually evolve. This position created a unique opportunity to bridge the gap between faculty and students by integrating the knowledge and experience of the profession, while understanding how medical students optimally learn.

With great opportunity comes great responsibility. In order to best serve my students, I needed to continuously enhance my own medical knowledge and solidify foundational concepts. Equally important, I sought to implement an approach to learning in which collaboration was utilized so students and I could understand things from different perspectives. In working in such a collaborative environment, I realized the amount of trust the students place in me—just as I know patients place the same unequivocal trust in physicians. This has helped me work that much harder to present concepts in a clear and precise manner, to better facilitate understanding in both students and future patients.

My desire to positively impact the students also served as my greatest obstacle. I didn’t want them to simply memorize material for an exam. I wanted them to develop a true understanding of the processes and concepts being taught. With true understanding comes the ability to think critically, which is imperative when treating patients, as each patient’s case is unique. The ability to think critically about a constellation of signs and symptoms is the cornerstone of good medical practice. As a medical student, I could connect with the students on a peer level and help them identify problem areas in their studies, while working with them to overcome these hurdles so they are equipped with the tools needed for lifelong learning and practicing.

Drew Charles

Working closely with professors allowed for a collaborative process to supplement the usual didactic approach. As a student, I brought a constructive perspective while the professors input their experience and knowledge. This created an academic synergy that allowed for enhancement of the educational process. We were able to transparently discuss strengths and weaknesses for each session so we could continuously make improvements for subsequent classes. Barriers in communication were targeted so students were better able to process and understand the information. The professors helped expand my knowledge, refine my teaching style, and learn effective communication. They encouraged me to seek teaching opportunities in our community through facilitating a program geared toward teaching science to high-school students, while illuminating the possibilities offered by a higher education.

This past year as a graduate teaching fellow instilled in me a new skill set. I solidified my foundational knowledge and developed maturity, patience, creativity, confidence, and a passion for teaching—all traits that will help me become a better osteopathic physician. After completing the year, I found that academic medicine is my passion, and I envisioned collaborating with residents and interns so patients can benefit from a shared pool of knowledge. My enhanced understanding paired with effective communication skills and yearning for lifetime learning have allowed me to establish an approach beyond the standard care of medicine. Both teaching and learning go hand-in-hand, and it is just as important for the teacher to learn from the student as vice versa. As a future osteopathic physician, I will be taught something new by each and every patient.

I plan to embody lifetime learning so both students and patients can be impacted in a positive manner. It is my sincere hope that all I've learned over the last few years as a student and a teacher will continue to help LUCOM classes and our patients well into the future.

STEVIE VETTER



“**Y**ou have cancer.” The three words you never want to hear as a patient, and probably the three words that physicians dislike saying to their patients. These are the exact three words I heard as I was finishing my last class of my first year of med school.

Thankfully, I had the “best” type of cancer to get, testicular cancer—specifically, a pure, classic seminoma. I was obviously surprised, but God gave me strength. I trusted that the Lord had a plan for me through this trial, and I knew His strength would get me through it. *“And we know that in all things God works for the good of*

those who love him, who have been called according to his purpose.” –Romans 8:28.

I had a successful surgery and spent a week recovering at home. Then, life went on as normal. I went to Philadelphia for a mission trip and to Chicago for the Council of Osteopathic Student Government Presidents/American Osteopathic Association conference. I entered my second year at LUCOM in the “surveillance stage,” which meant getting CT scans and blood work every three months. My September CT scan came and passed without any issues. I had pretty much put cancer in the rearview mirror as something with which I merely had a “paper-cut” interaction.

After my December scan, however, I received two phone calls from the doctor. The cancer had spread to a para-aortic lymph node, which was found to be 6 cm in size.

I praise the Lord that after three months of chemotherapy, the tumor in my lymph node has shrunk to a fibrotic mass of only 6 mm in size—an astounding outcome. But after 20 chemotherapy treatments and three months of waves of intermittent adverse effects, I was bound to be affected in more ways than just physical changes.

My heart has grown to be more relaxed and patient. The line in Chipotle doesn’t bother me as much as it used to. The piles of dirty dishes don’t induce frustration anymore. I am at peace. My faith in God is strengthened. I went through a dramatic struggle, and with Christ, I overcame. Psalms 18:2a has come alive for me: *“The Lord is my rock and my fortress and my deliverer; my God, my rock, in whom I take refuge...”* I needed Him to be my rock. He is. I had to rely on the Lord to be my deliverer. He delivers.

During treatment, I saw hundreds of patients and their families while I walked through the hospital toting my IV pole along. The combined concern and vulnerability displayed on the faces of these people was often palpable. I am motivated to become the best physician I can be, to help patients persevere to good health.

As 2018 begins, I find myself reflecting on this past year and, above all, I am thankful. Two weeks after I finished chemotherapy, I was at Disney World. One month after

Stevie Vetter

chemotherapy, I was tutoring students in neuroanatomy. Three months after finishing chemotherapy, I went to Guatemala for 20 days. And six months after finishing chemotherapy, I completed a triathlon. I am thankful for the astounding support I received from strangers, friends, physicians, nurses, my LUCOM family, and my family. I am thankful for the support from the Word of God and His Holy Spirit. Thank you all for walking through this trial with me. I ask that you, the reader, to walk alongside the next person you see going through a trial, and encourage him or her each step of the way.

PATRICK YANG



I have a relentless passion for research and have seen firsthand how incremental improvements in clinical techniques impact patients' lives. My desire to conduct exhaustive, diligent research parallels closely with the processes associated with my hobby of running competitively. Similar to training for the Los Angeles Marathon, research projects require hours of dedication and the ability to overcome adversity. Recently, I had the unique opportunity to be recognized at a national urology conference for a novel surgical technique that led to less radiation exposure in patients and promising

results. I feel a great sense of accomplishment having the ability to improve the health outcomes of patients, and since being recognized, a spark has been ignited in me to expand future research projects. Research is ultimately the engine advancing global medicine, and I look forward to continuing to push the boundaries to develop the best possible care for patients.

For one project, I was fortunate to work with Dr. Duane Baldwin in the Urology Department of Loma Linda University, studying novel surgical techniques for patients with staghorn kidney stones. Conventionally, the surgical procedure known as percutaneous nephrolithotomy requires the use of fluoroscopy and can result in significant radiation exposure to the patient, surgeon, and ancillary medical staff. An innovative surgical technique known as laser direct alignment radiation reduction technique (DARRT) was used in 25 patients. The intraoperative outcomes achieved significantly lower access times and total fluoroscopy times, compared with percutaneous nephrolithotomy, leading to less radiation exposure. This research demonstrated beneficial and safe short-term and long-term outcomes in patients, and additional safety improvements for the medical staff inside the operating room. I did further work with Dr. Baldwin and biomedical engineers in innovating a special surgical needle for this particular surgical technique, which is currently entering the initial phases of the Food and Drug Administration's approval process. After receiving recognition and honors at a national urology conference and on Loma Linda University Research Day, I am eager to continue progress and adaptations made in this field.

The fruits of ingenious research can dramatically improve the health of patients who are the most in need. It seems that, far too often, populations who face an enhanced need for critical health care services confront difficulties in accessing quality health care and basic amenities. As a result, my passion for global medicine has led me to consider the multiple opportunities to care for patients beyond domestic regions and in the broader

Patrick Yang

global context. During my mission trips to Nicaragua, I helped to install freshwater pipes and build bathrooms throughout rural communities. After speaking with community leaders, I found they were extremely grateful for amenities that we take for granted every day. The ability to make positive impacts on peoples' lives who have limited opportunities is something I hope to continue to do as a physician my entire career.

Research impacts entire populations of patients when a new discovery effectively enhances existing clinical criteria. The field of medicine makes continuous advancements in a variety of specialties, and osteopathic medicine is no exception. I believe the potential for research to advance the utilization of osteopathic medicine is significant. I am currently working on a project with Dr. Van Duyn at Community Memorial Hospital, analyzing the use of osteopathic manipulative treatment (OMT) in the orthopedic clinic. The project entails reviewing common diagnoses, evaluating which type of OMT can be utilized, and determining how much time should be allocated for OMT. The orthopedic clinic is an exclusive opportunity to deploy OMT as first-line treatment, adjunctive treatment, and supportive therapy until a definitive treatment can take place. I believe OMT can be applicable to almost any field, including my fields of interest, urological and orthopedic surgery.

I am determined and excited as I embark on a race of a lifetime to advance the field of medicine through innovative research. As a compassionate physician, a versatile role can be embraced not only as a healer of the mind, body, and spirit, but also as a research innovator. I hope to provide solutions to complex problems through advanced research and to increase access to the highest quality medical care for patients in a global context. It is an honor to have the opportunity to be considered as the National Student Researcher of the Year. Research will always be a passion of mine, and contributing to the development of a novel surgical technique is just the beginning of my lifelong plan to become a research mentor and positively influence future generations.

ETHAN BLOCHER-SMITH



When considering how research has contributed to my developing skills and knowledge as an OMS-III, I have concluded that research is the lifeblood of medicine. One needs to look no further than the UpToDate medical resource to see how methodological study is essential to medical practice. Extensive and well-controlled research is the only way to accurately test treatments and show categorical improvement. This focus on a science-based medical perspective is key to giving patients the most effective interventions, while protecting those patients from com-

plications and unnecessary tests. In the words of A.T. Still, “Let us not be governed today by what we did yesterday, nor tomorrow by what we do today, for day by day we must show progress.” As progress in medical science continues to increase in speed, a sound scientific literacy in research is increasingly key to success.

My focus on research work has improved my quality as a physician in multiple ways. I have found there is much value in reading and understanding scientific literature in order to stay on top of current medical advances, as well as in personally conducting research, rather than simply observing from the sidelines. I value the rigor that scientific research has taught me, including providing practice in classifying patient severity, evaluating complications, and assessing lab results. Participating in research during medical school, through both writing background text for publications and through literature review, has helped me understand how to search existing information and find out what the medical community has learned about various conditions. This experience has also allowed me to see the practical application of my coursework in the clinical setting, understanding why and how lecture-hall topics are essential in day-to-day practice. I have learned how to effectively communicate with peers and mentors in the medical profession, forging relationships with physicians that I hope to continue long into the future.

I believe research trains you to focus on the whole person, much as the osteopathic profession seeks to provide health in every domain of life. Completing research work has taught me to look for confounding variables and to closely examine every part of a result. Too often a proper diagnosis can be missed due to not asking a pertinent question, in much the same way that a study can be invalidated due to missing a common thread that was never considered. My work in study design and data acquisition has educated me in how to find those threads, how to anticipate and correct for unseen challenges, and how to adapt and learn from the results. In addition, one of the most useful skills I have gained throughout my research experiences has been the use of electronic

Ethan Blocher-Smith

medical records, allowing me to familiarize myself in a low-stakes environment so that I am able to excel in my clinical rotations. Lastly, research has been an important part of building my resume. I intend to enter surgery as a specialty, and as such, laying the groundwork for that choice with high-quality research and publications is key to my future learning goals.

As a current OMS-III and a future DO, I see research as a core part of who I am and who I am becoming. I have dedicated a sizable portion of my life to learning about and performing research in the chemical, biological, and medical settings. The skills that I have gained in understanding publications and learning about standard-of-care will hold me in good stead for my future as a physician. I believe that it is my responsibility as a member of the medical community to contribute to advancing its knowledge, to improve the care of my patients, and to help my colleagues do the same. By practicing clinical medicine, I can help make my individual patients' lives better, but through conducting research, I can help improve even more patients' lives across the globe. I hope that through my work in research, along with my professional practice, I can fulfill the goals of osteopathic medicine, and, in so doing, show myself worthy of the title of DO.

NICHOLAS CAVANAUGH



In my first year of research, I struggled to see the utility in what I was doing. I wanted to “change the face of medicine,” and I had many other overly ambitious ideologies that an aspiring medical student often dreams about. After joining the research process, I quickly realized that it takes more than a lab coat, an undergraduate degree I remembered little from, and a hungry drive to have success in my field. Having spent months navigating the right jargon and the politics of animal husbandry, and learning assays that I spent one day doing in biology lab, I began to understand that research is not simply

done by hard work and knowledge. Rather, it is learned in an exponential manner of trial and error.

Although I have worked on various clinical projects, my most notable research has been done in Dr. Joseph Turek’s lab creating a mouse model that emulates the clinical and mechanistic pathologies of Marfan syndrome in a testable amount of time. There previously had been no viable methods to test any acute genetic expression changes or pharmacologic efficacies related to this condition over a reasonable amount of time. We elucidated this model, which induces ascending aortic aneurysms (the most morbid consequence of the sequelae of Marfan syndrome), in two weeks. We then determined that transient receptor potential (TRP) channels are differentially expressed, and likely play a role in aneurysmal growth. A TRP channel called TRPC4 is massively upregulated in mice with Marfan syndrome. If the condition is antagonized pharmacologically, aneurysm formation is significantly diminished. When this pharmacologic treatment is used in combination with the syndrome’s current treatment of losartan, aneurysm formation is attenuated far better than when losartan is used alone. While the translation of this mouse research to human pathology has a long way to go, the idea of multimodal therapy and genetically targeted drugs points optimistically to the future of Marfan syndrome treatment.

Although I plan to be deeply involved in the continuation of my current research projects, my osteopathic training and mentality is pivotal in terms of my approach to care. While my goal is to pursue a surgical specialty, my education has imprinted the importance and usefulness of prevention. Even though many times surgery cannot be avoided, my understanding of facial planes, tensegrity, and musculoskeletal anatomy will hopefully lead to better recovery times, less invasive techniques and, if possible, the aversion of surgery to begin with. In my own literature review, I am excited to see all of the opportunities available to research osteopathic principles within the surgical fields. In a

Nicholas Cavanaugh

predominately allopathic specialty, many surgeons are naïve to manipulative therapy and osteopathic considerations. They are not well equipped to apply principles of osteopathy. That is a niche I would love to exploit in my own research studies. For example, there are many diseases that present with systemic edema as a result of poor kidney function or colloid imbalances. The indications and efficacy of effleurage and lymphatic drainage techniques have not yet been measured independently in such cases. Much of my direction has been focused on surgery, but my schooling and research experience have given me the skill set to continuously look for ways to improve outcomes in any field and to publish these newfound processes.

With great ambition to incorporate research in my career as an osteopathic physician, I am honored to have had the opportunity to apply for the Student Researcher of the Year award. And I am forever grateful to my professors at Marian University College of Osteopathic Medicine who have bolstered my medical knowledge in every way—and to my research mentors who have taken the time to teach me what it means to be a man, a physician, and an innovator.

KATHARYN D. CASSELLA



In March 2015, I was approached by the admissions director of Marian University College of Osteopathic Medicine (MU-COM) with an unbelievable opportunity—design a nationally advertised Pre-Student Osteopathic Medical Association (SOMA) Conference. I could feel my mind buzzing as I imagined the possibilities. Not only was this an opportunity to showcase the benefits of osteopathic medicine to premedical students, but it was also the chance to present the amazing things we were doing as a new medical school. From the beginning, a major goal was to create an experience that

would be more than just an entry on their resume. I was determined to expand their understanding of, and interest in, the value of osteopathic medicine. I challenged my team to avoid the “standard” conference agenda, seeking a more dynamic approach that allowed participants to tailor their experience to their own interests. Our “TEDx” style conference provided individualized attention, dividing the more than 130 registrants into groups limited to 25 students over breakout sessions. This created a dynamic and engaging experience.

After proposing several possible designs, my team and I were able to engage MU-COM’s administration with the idea that setting ourselves apart as a prominent leader among medical institutions began with “thinking outside of the box” and re-imagining what a medical conference could look like. After much thought, planning, deliberation, and negotiation, our vision was finally realized.

Each track included an osteopathic principles and practice lab and an anatomy lab tour. Our keynote speaker was Adrienne White-Faines, the chief executive officer of the American Osteopathic Association. She presented the future of osteopathic medicine, igniting student interest and increasing my drive to “DO more.” I drew from her inspiration to do more than maintain what has historically been the status quo—bringing potential students to an osteopathic medical school and generating short-term excitement during a conference. We decided to create a longitudinal experience for the more than 130 undergraduates from across the country who visited MU-COM. Of the students that we welcomed to our campus during this event, more than 100 applied to MU-COM in the subsequent application cycles.

The planning and implementation of a conference of this scale was not without difficulty. However, my exposure to collaboration and communication across a multitude of units and departments in this professional setting taught me valuable lessons and inspired me to pursue more advanced leadership positions within SOMA. Specifically, I strived to

Katharyn D. Cassella

continue to inspire current and future osteopathic medical students through my efforts as Region II trustee and national president of SOMA. I have dedicated much of my effort to impacting future osteopathic medical students. We are developing Insight, an interviewing initiative using the StoryCorps organization. The initiative promotes and supports the wellness of medical students and physicians. Our newly developed strategic plan is centered around opportunities in advocacy, leadership development, and mentorship for our members. Pre-SOMA continues to expand the number of chapters on undergraduate campuses.

At MU-COM, our SOMA chapter remains one of the most active, and potentially the strongest in the country. I am honored to have worked with incredible colleagues and leaders during each of my experiences in my three-and-a-half years of medical school. The possibility of positively affecting future medical students has fueled my passion for osteopathic medicine. My skills in the areas of communication, compassion, and leadership have been advanced, while my confidence has grown. Through these professional experiences and personal development, my commitment and resolve to fulfill my destiny as a future osteopathic physician, patient advocate, and leader have grown exponentially. I look forward to serving the Osteopathic Pledge of Commitment and to live “each day as an example of what an osteopathic physician should be.”

TAYLOR DICKEY



I grew up with little interest in medicine. Despite having a family with four doctors, medicine was never on my radar for career choices—that is, until I went to a small, impoverished island off the coast of Haiti named La Gonave. With no formal medical training, my main job was distributing water filters, while my father, a cardiologist, was taking care of sick patients. Even though I knew what I was doing was important, I saw the limitations of the good that I could accomplish. During that week, I realized the potential of how much value a career in medicine could bring to my life and, more

importantly, to other people's lives. At the time, I don't think I appreciated how much that trip would change my life trajectory. When I came home, I signed up for the MCAT and planned my coursework for the next year-and-a-half to give me the best chance of qualifying for medical school.

Fast-forward to my second year as a medical student, when I had the opportunity to go to Peru through Michigan State University College of Osteopathic Medicine for a medical mission. I applied for a research position and was ironically placed as the leader of the water-quality team. It was a surreal moment to see how much had changed in the three years since I had been in Haiti. Now I was able to lead the type of project that brought me into medicine in the first place, and I was performing some of the same physical examination techniques that I had watched my father perform in Haiti. The experiences that I consider the foundations of my medical education have their roots in biosand filter research and the water-quality projects that turned my attention toward the medical field. As I continue my medical education, I look forward to continuing my research on biosand filtration. We are continually working on expanding the project to aid more people along the Amazon River and, hopefully one day, many other countries. The project's emphasis on preventative health has taught me to value the preemptive measures that are vital to maintaining a healthy population. Cultural and language barriers made our research rely heavily on effective patient education, which is a skill I hope to further develop as I continue the journey of becoming a physician.

Finally, my experience in the realm of research has helped me utilize the skills necessary for other research projects that I am drawn to, such as the case presentation regarding influenza B and myocarditis that I am currently working on. Research is one of the fundamental pillars of medicine. It is how we learn the best ways to manage and treat the patients that we deal with on a day-to-day basis. I hope that one day my research will positively impact the patients that we treat and facilitate a better doctor-patient relationship.

MEGHAN PICCININ



In what I assume is a common cliché amongst medical students, my primary goal as an osteopathic physician is to help as many people as possible. Alas, achievement of this objective is often unduly limited by the harsh restrictions imposed by time. A doctor can only see a certain number of patients per day; a delicate surgery cannot be rushed. During my tenures as an undergraduate, graduate, and medical student, I have sought a means to overcome this temporal barrier. How can I extend my reach as a future physician to better the lives of more patients than I can see in a day? The answer I

have found to this quandary has been through research, which is one of my personal passions. Research allows a scientist or physician to share his or her knowledge to influence scientific and medical decision making in disparate laboratories and clinics throughout the world.

My love for medicine is not restricted to a singular topic, but spans the full spectrum of understanding human physiology and pathology. Similarly, my research endeavors have encompassed a variety of disciplines. During my duration as an undergraduate, my research focused on exploring the epidemiological interrelationship between psychiatric and dermatologic disorders. In addition to publishing and presenting this work, the insight I gained into the profound impact skin conditions can have on a patient's psychological well-being has been a primary influencer in my desire to pursue a career in dermatology. As a graduate student, the focus of my master's thesis was elaborating the effects of diabetes on the bone marrow and how the marrow changes affect the endothelial progenitor cells responsible for ameliorating vascular complications. This project piqued my interest in stem-cell biology and regenerative medicine, aided in developing my critical-thinking and laboratory skills, and instilled in me a deep-seated appreciation of the scientific method.

As a medical student, I collaborated with scientists at Wayne State University to develop and validate a high-throughput screen for molecular activators of SM22 – a protein whose expression is diminished in atherosclerosis, aneurysms, and some forms of cancer. In the process of identifying 11 potential inducers, I became more intrigued by pharmacology and the process of drug development. Another project I undertook during medical school was an investigation of the implementation of alternative payment models as reimbursement for total hip and knee arthroplasties. The project was performed with the orthopedic surgery team at Detroit Medical Center. This experience introduced me to more clinically oriented research and prompted me to consider

Meghan Piccinin

where other cost-savings could be found in the current medical system. Since beginning clerkship several months ago, I have undertaken a novel research project with Healthy Trenton, a program to promote health and wellness in the city of Trenton. Although still in its infancy, this endeavor aims to evaluate how the health-promotion programs of Healthy Trenton influence the outlook of participants on their health and well-being. My collaborators and I were prompted to pursue this project by seeing the same patients repeatedly in the hospital, and we hope to elaborate on the importance of primary prevention of disease, rather than just treatment.

The scientific investigation I hope to pursue as a practicing physician draws upon findings gained through each of my prior research experiences – dermatologic disorders, cellular biology, drug development, reducing medical expenditures, and disease prevention. I hope to focus on the tanning reaction in melanocytes – how ultraviolet (UV) radiation drives the production of melanin in these cells to produce a darker complexion. Despite the well-publicized risk of UV radiation inducing skin cancer, millions of people still bask in the sun without adequate skin protection. My research goals involve identifying and testing molecules that drive the tanning reaction without the inherent dangers of UV radiation damaging DNA. Several compounds are already known to induce melanin production without major sequelae, though research on them appears to have halted. By further elaborating on the safety and applicability of these compounds, I hope to develop skincare products that can give people the natural tan they desire, eliminating the perceived benefits of sun exposure and thereby reducing the burden of skin cancer.

DARIN QUACH



Looking back at the first time I held a pipette, the only thing that comes to mind is months of trying to make plasmid constructs to study cellular protein translocation. That was the first time I was exposed to molecular cloning, and it was during a summer research internship at the California Institute of Technology. I worked under the supervision of Dr. Shu-ou Shan, and while most of the time spent that summer resulted in failed experiments, the techniques I acquired positioned me to succeed in all my ensuing research experiences.

Following that summer, I found myself drawn toward bacterial pathogenesis after taking a microbiology course. Shortly after obtaining a research technician position in the laboratory of Dr. Victor Nizet, my interest in understanding bacteria and how they interact with their hosts to cause disease was well underway. During this time, I investigated how pathogens, such as *Staphylococcus aureus*, *Streptococcus pneumonia*, *Streptococcus pyogenes*, and *Streptococcus agalactiae*, are able to evade innate immunity. This momentum carried over to my next position as a lab manager at San Diego State University, where I worked under the tutelage of Dr. Kelly Doran. Her expertise was in host-microbe interactions, with an emphasis on the development of neonatal meningitis. While pursuing the opportunity to further understand how these pathogens cause disease, I was able to contribute to seven peer-reviewed publications.

After matriculating in the DO/PhD program at Michigan State University, I decided to join Dr. Robert Britton's laboratory, where I studied probiotic mechanisms of action and host-microbiota interactions. My dissertation topic investigated the role of the probiotic *Lactobacillus reuteri* in impacting bone health, immune-cell (monocytes and macrophages) maturation, and the microbial community in the gastrointestinal tract of mice. This research continued to solidify my understanding of how microbes in our bodies confer health benefits. For my graduate studies, the American Osteopathic Association awarded me a research fellowship, and I expect four peer-reviewed publications to result from my findings.

As I transitioned back to medical school after completing my PhD, my intention was to specialize in internal medicine, as gastroenterology has been an interest of mine for quite some time. However, I found myself drawn to the practice of psychiatry as I was completing my clinical rotations. There was no shortage of interesting cases in this field, since even common conditions, like depression or anxiety disorders, rarely present in the same way among different patients. Additionally, I discovered that osteopathic

Darin Quach

principles were deeply rooted in the practice of psychiatry. The points that Dr. George Engel alluded to in his biopsychosocial model, in which a fine understanding of the biological, psychological, and social dimensions is crucial for the adequate care of patients, closely align with the tenets of osteopathic medicine.

There has been increased interest in understanding how the gut microbiota impacts the development of psychiatric and neurological disorders in the context of the gut-brain axis. In accordance with the individual being a unit of body, mind, and spirit, the interactions that take place in the gut can have a profound effect on the person as a whole. Coupled with my background in studying host-microbe interactions in the gut, pursuing psychiatry as a career was an obvious choice for me. Consequently, all my experiences thus far have reaffirmed my goals to become a physician-scientist and an independent investigator in academic medicine. Because the practice of psychiatry is so holistic by nature, I find that my training as an osteopathic physician puts me in an excellent position to succeed as a physician-psychiatrist, as well as an independent researcher. In the future, I envision developing a research program that revolves around understanding the person as a whole, as I examine the relationship between the microbiome, immune activation, and development of psychiatric illnesses.

LAURA HARDING



The journey into the world of research is not an easy one. There are no street signs telling you which way to turn, plenty of dead ends, and the feeling that you are always running on empty. Early in my undergraduate education, I found myself stumbling down this rabbit hole. This was not because I fell in and did not know how to get out, but rather because I needed to know more information. First I asked, how do I work in a research lab? Then I asked, how do I determine the molarity of this stock solution? And now I ask, how do I measure the neurosynaptic alterations in autism spec-

trum disorder? I attribute the progression of my research skills and interests to several important mentors who have supported me throughout my journey. These individuals taught me patience, passion, and precision, as well as how to laugh at yourself when you mess up. I have found the latter lesson to be most vital. As with most other researchers, I am here because of the men and women, scientists and osteopathic physicians, who realized the importance of reaching out to me as a future conveyor of the profession. One of my greatest privileges is to continue this process of mentorship and to support junior students in the field.

I know that my research contributions have impacted their respective disciplines in certain ways. My findings in the use of an adenovirus toxoid vaccine for *Clostridium difficile* infections provided direction for a graduate student's research. My work in RNA analysis in adenovirus immune responses helped a graduate student publish a paper on the effectivity of adenovirus vaccination, which progressed to a clinical trial. I also led a study on cervical cancer prevention in Peru, which aims to improve cancer prevention methods in regions with limited access to medical infrastructure. In my current lab, my ideas and collaborations on elicitation of neural plasticity and the use of an optogenetic model in studying corticothalamic changes in autism spectrum disorder have provided direction in a new area of investigation, which I am actively pursuing. I am proud of my accomplishments thus far. However, I believe that the most impactful contributions I have made have been in encouraging, supporting, and mentoring students.

As a dual DO/PhD student in my third year, I work closely with my peers in medical school and graduate school to build translational research foundations. In my second year at med school, I became the research team leader for our annual medical service elective in Iquitos, Peru. I used my skills in research design and data analysis to investigate the unusually high cervical-cancer mortality rate in Peru. We discovered that the genotypes of human papillomavirus (HPV), the causative agent of nearly all cervical cancers,

Laura Harding

may differ in Peru from the typical distribution worldwide—and may not be covered by current vaccination. I traveled to Peru again the next year with two fellow medical students, whom I recruited to join the study team. Together, we collected cervical cell samples, and I explained my methods of experimental design, DNA isolation, and polymerase chain reaction (PCR). This work resulted in four abstracts in 2016 and 2017, and it received national recognition at the American Osteopathic Association's Osteopathic Medical Conference in 2016. With our findings, we hope to improve the methods of cervical-cancer prevention and detection in the underserved regions of Peru and other regions with limited access to medical care.

Sharing my excitement and findings in the lab with undergraduate students is very gratifying. I have been given the privilege to participate in the Michigan State University College of Osteopathic Medicine's DO/PhD program because graduate students, physicians, and researchers took the time to share their passions throughout my undergraduate training. I hope to continue this tradition of mentorship and pass down my passion for medicine and research. Our osteopathic philosophy teaches us to consider the structure and function of our multiple body systems as they interact to promote the health of the whole person. When basic science research connects with patient care using translational research and osteopathic concepts, we maintain our focus on our ultimate research goal: to assist the human body in maintaining health and repair of disease. Mentorship is crucial to this process. I look forward to a future in which I incorporate research into my practices in osteopathic medicine through collaboration and communication with students, colleagues, and mentors.

BRIANNE FELDPAUSCH



Growing up on a third-generation dairy farm in a rural village of 1,200 people, my four brothers and I were expected to analyze our farm chores for improvements and prevention of future malfunctions. Our parents also expected us to serve in our community, so that giving back became a way of life rather than a choice. With this mentality ingrained in me, a mindset for disease prevention and a holistic approach to medicine came naturally. My passion for community medicine is rooted in my love for people and my commitment to serving vulnerable populations. As an osteo-

pathic medical student, I aspire to serve people experiencing homelessness by addressing socioeconomic barriers and their health care consequences, and I seek to pursue social justice through medical care.

After volunteering with a street medicine team in Pittsburgh, Pennsylvania, during my gap year, I felt inspired to bring my experiences to the streets of Lansing, Michigan. In June 2017, after nine months of networking with 17 local service organizations, discussing logistics and funding with faculty, and developing a mobile medical clinic, Spartan Street Medicine (SSM) was born. I founded this program with a commitment to the ideals of social justice and the right to health care. With these ideals at the core of SSM, we aim to holistically serve people experiencing homelessness by treating medical issues with follow-up appointments, integrating health literacy and social services, and, most importantly, offering hope with quality care to each unique person.

Our program operates with community partners in Lansing, including the Projects for Assistance in Transition from Homelessness (PATH) outreach team and the Lansing Justice in Mental Health Organization (JIMHO) drop-in center. Our weekly SSM clinics at JIMHO bring together 10 osteopathic medical students (from a rotating pool of more than 150 culturally trained volunteers) and two volunteer osteopathic physicians, to regularly provide health services directly to our underserved community members. In keeping with our osteopathic philosophy of caring for the whole person, each patient is offered hygiene items and socks in addition to the medical services. We also connect patients to health insurance, follow-up medical care, and health-prevention services, while targeting emergent needs as they arise. This included partnering with the county health department to offer vaccines for Hepatitis A during the recent outbreak of this virus among the Michigan homeless population.

With the guidance of the PATH social services professionals, the SSM outreach team ventures biweekly into homeless encampments in urban forests, along riverbanks, and

Brianne Feldpausch

under the bridges of Lansing, to provide medical care and comprehensive services to people struggling with homelessness. We keep these teams small, with three PATH professionals, three osteopathic medical students, an attending physician, and an occasional police officer and/or addiction-support specialist. With flashlights in hand, our teams walk camp-to-camp carrying backpacks filled with diagnostic equipment, individually packaged medications, and durable medical supplies, along with food, water, socks, blankets, and ponchos, so that we may holistically serve each person sleeping outside. I designed these backpacks and this model of care based on my experiences with the successful street medicine team in Pittsburgh.

As an Albert Schweitzer Fellow and as the founder of SSM, I, along with my phenomenal team and the support of our school, strive to adapt our patient-centered model to meet the unique needs of each patient. When seeking care, people struggling with homelessness are often accused of noncompliance when unable to achieve the unrealistic goals of their care plans due to psychosocial circumstances. By respectfully attempting to understand the barriers they face, we can meet people on their terms with practical changes for improved well-being. Our holistic, multidisciplinary teams seek to not only bridge this gap in health care, but also to instill empathy and humility in osteopathic medical students through a full-sensory service experience in the field. By doing so, we hope to create a ripple effect of a pursuit toward social justice through medical care.

With my dedication to preventive medicine and my love of community engagement, I aspire to pave a career, working alongside a multidisciplinary team, that extends beyond the walls of a structured health clinic. Despite our nation's socioeconomic and health care challenges, I am motivated to practice street medicine and encouraged by the resilience of those we serve. Street medicine truly embodies the principles of osteopathic medicine in caring for the whole person. We provide each individual experiencing homelessness with holistic care that promotes not only his or her physical health as a patient, but also that individual's emotional and spiritual well-being as a person.

JULIA SCHNEIDER



Having had a strong interest in the brain since high school, I decided to investigate this interest in my undergraduate years at New York University (NYU), where I majored in neural science. My interest in the brain, patient care, and surgery turned into a life-long pursuit in neurosurgery. As an aspiring neurological surgeon, I knew that I did not want to just study the brain and spine, but rather, I wanted to see what I could do to push the field forward for the patients. In each and every one of my research pursuits, I consider the quality of life of patients. I believe in maintaining a balance

of establishing new advances in research and considering how this research can benefit patients over the long term. I seek to acquire the skills of a scientist to be able to become a physician-scientist in the future.

I began conducting research in the neurosurgery department at NYU Langone Medical Center as a freshman. I helped to build an eye-tracking device to study how eye movements are associated with traumatic brain injury and concussion. Analyzing the eyes as a means to understand what is going on in the brain showed me the unity of the human body and opened my eyes to osteopathic medicine. I was not merely studying the main location of the pathology, but observing other parts of the body. Based on my eye-tracking research, I published two papers focusing on traumatic brain injury and cranial nerves palsies. At the same time, I was pursuing the bioethics side of medicine to learn more about patient care and the significance of quality of life. In *Medical Dialogue Review*, I published two papers on physician-assisted suicide and the threat of misdiagnoses in patients with dementia.

After my time at NYU, I transitioned to explore neuro-oncology in neurosurgery. My primary mentor, John Boockvar, MD, inspired me to pursue clinical research, instructed me on writing clinical trials for his tumor patients, and encouraged me to conduct research directly in his Brain Tumor Biology and Therapy Laboratory. I learned that the main impediment to drug delivery for brain tumors is the blood-brain barrier (BBB), which is of interest to me. Dr. Boockvar's expertise in neurological surgery lies not only in brain tumors, but also in using intra-arterial chemotherapy delivery with BBB disruption. Thus, I encouraged him to use intra-arterial delivery of trastuzumab for HER2-positive glioblastoma as well as intra-arterial delivery of ado-trastuzumab emtansine for recurrent HER2-positive breast cancer brain metastases. Aside from writing my own clinical trials, I pursued studies about the skull base and vascular dimensions of neurosurgery, publishing more than 30 papers and abstracts.

Julia Schneider

My time in the basic science research laboratory was centered on developing radiosensitizing therapies for radiotherapy-resistant malignant brain tumors. I will be pursuing a neuro-oncology neurosurgery research fellowship for a year after my second year of medical school to explore this issue in more detail. I will be studying the cholinergic modulation of microglia to radiosensitize glioblastoma, which is the most malignant primary brain tumor. All glioblastoma patients receive radiotherapy as part of their current standard of care, which, unfortunately, leads to devastating adverse effects, such as radiation necrosis and, eventually, cognitive decline. This research will contribute to the patient's quality of life with the purpose of decreasing radiation doses while maintaining therapeutic efficacy.

As an osteopathic student physician, I have seen the three-dimensional aspect of research, from bench to bedside. I conduct translational basic science research by developing new therapies, I write clinical trials, and, in the end, I observe how these patients do and retrospectively review their outcomes. Having this perspective in research is unique, as I am able to constantly be thinking of different approaches at the bench to improve bedside delivery and vice versa. Considering the patient's quality of life is always at the forefront of my mind. As a future osteopathic physician, I plan on encouraging my fellow colleagues to join me on this pursuit to constantly improve and discover novel ideas and angles in neurosurgical patient care. I don't see my future patients as experiments; I see them as individuals whose lives I am currently seeking to improve.

KATRINA BANTIS



I'm a dedicated, hard-working student interested in pursuing a career as a general surgeon but also as a scientist and educator. Having pursued basic science research for six years and clinical research for one year, as a clinical research coordinator at the New York University (NYU) School of Medicine, I understand that medicine and research are inextricably linked. As a medical student, I've had the pleasure of working in Dr. Qiangrong Liang's lab for the past 14 months conducting cardiovascular disease basic research. During this time, I've written abstracts and shared my findings with

other interested researchers, experiences that I know will serve me well as an aspiring clinical academic. In fact, this past October, I had one of my abstracts accepted for poster presentation at the Osteopathic Medical Conference and Exposition (OMED) in Philadelphia, and I was honored to win first place in OMED's Student Poster Competition. This gave me the opportunity to expose an important area of research—mitophagy—to a national audience.

Previous literature has shown a clear, yet undefined, relationship between fasting and preserved cardiac function. Indeed, it's been demonstrated that fasting attenuates acute ischemic injury, chronic cardiac remodeling, and heart failure in mammalian models. Mitophagy, or mitochondrial degradation, has been implicated in mediating such cardio protection. However, the underlying molecular mechanism remains uncharacterized. It is known that mitophagy plays a homeostatic role in mammalian cells, targeting excessive or damaged mitochondria for lysosomal degradation.

We previously showed that one-day fasting accelerated, while two-day fasting reduced, mitophagy flux in the mouse heart, suggesting time-differential effects of fasting on cardiac mitophagy. We are currently focused on determining whether mitophagy needs to be maintained at a certain level in order to provide cardioprotection in mice during fasting. We're comparing the cardiac function of fasted wild-type mice; transgenic mice with moderate- and high-expression levels of parkin (an E3 ubiquitin ligase that tags damaged mitochondria for degradation in order to promote mitophagy); and parkin knockout mice.

This research has significant translational potential, as caloric restriction is a free and accessible dietary recommendation. Thus, knowledge generated from this study can be readily translated to a clinical setting. Furthermore, the study aims to characterize the molecular mechanism responsible for cardioprotection during fasting. We're hoping to eventually understand this signaling process and harness its potential for therapeutic

intervention in heart disease. As an osteopathic medical student who has learned to view the body as a self-regulating, self-repairing unit, I see mitophagy as a small-scale, intracellular version of the larger homeostatic processes involved in regulating the body's organs. My results up to this point have demonstrated that adopting certain lifestyle changes (specifically, dietary changes like fasting) may reduce the development of age-related diseases. I'm fortunate to be working in an area of research that has a powerful potential to transform the field of medicine due to mitophagy's regulatory role in certain age-related pathologies.

In addition, I've continued to collaborate with the NYU department that I formerly worked in as a clinical research coordinator. I'm a co-author on a manuscript that was submitted for publication to the American Journal of Respiratory and Critical Care Medicine in November 2017, as well as on two abstracts that are being presented at the American Thoracic Society's annual conference in May 2018. All three of these works focus on the lung microbiome of patients with nontuberculous mycobacterial bronchiectasis. I've indeed found my niche at the crossroads of medicine and research, and it would be a great honor to be recognized for my efforts by the committee.

As further evidence of my dedicated pursuit of a balanced career in terms of clinical medicine and research, I applied and was accepted into a competitive program offered by my medical school, the Academic Medicine Scholars Program. This program will give me the opportunity to carry out an additional year of bench research at my school in pursuit of a master's degree. In addition, I will lecture medical students, proctor anatomy and osteopathic manipulative medicine labs, and help my research mentor write grant proposals in support of my research project. My academic and personal interests align very closely with what the Scholars Program has to offer; it prepares medical students for a lifelong career in academic medicine, and that's exactly the direction in which I see my career headed.

JOSHUA CUOCO



In the Ramos lab, we demonstrated that the C57BL/6 mice strain, the most widely used mouse “control strain” in neuroscience research, exhibits spontaneous malformations (i.e., molecular layer heterotopia) of neuronal migration in the neocortex and cerebellar vermis. We studied the genetic mechanisms of these malformations and made the following four conclusions about both C57BL/6 neocortex and cerebellar vermis malformations: 1) They are weakly penetrant, divergent traits among inbred mice. 2) Homozygosity, at one or more loci, is required for the formation of heterotopia.

3) Heterotopia formation requires one or more C57BL/6 alleles outside of chromosome 1. 4) Heterotopia are present in diverse genetically engineered lines on a C57BL/6 background. These data are relevant toward understanding neocortical and cerebellar development and disorders affecting brain lamination.

Additionally, we characterized the cellular and axonal constituents of subcortical band heterotopia in BXD29-Tlr4^{lps-2/J} mice and demonstrated that various types of interneurons and glia, as well as cortical and subcortical projections, are found in subcortical band heterotopia. Regarding medical education research, we quantitatively showed that osteopathic medical students demonstrate greater interest than allopathic medical student in neurology and psychiatry, based on the proportion of residency program applications. However, they show similar interests as measured by matches.

In the Torres lab, we showed that in vitro ketamine intervention limits uncontrolled expansion of *Stachybotrys chartarum*, *Staphylococcus epidermidis*, and *Borrelia burgdorferi*. These data illustrate functional similarities between fungal, bacterial, and human ion channels, and suggest that ketamine, or its metabolites, not only act in neurons, but also in microbial communities colonizing human bodily surfaces. We wrote several review articles in the Torres lab. We described current knowledge about the glymphatic system and identified several osteopathic experimental strategies rooted in a mechanistic understanding of the glymphatic-lymphatic continuum. We proposed that brain arteriovenous malformations might share certain signaling dimensions with anorectal hemorrhoids, providing causal anchors to better understand these vascular pathologies. We discussed the interplay between glutamate transmission and glioma biochemistry and described current therapeutic strategies used to limit metastatic lesions in the mature brain. Lastly, we reported a case of a patient with an extremely rare spinal dural arteriovenous fistula. In collaboration with the neurosurgical attendings and residents at Carilion Clinic, we

published the first case of microsurgical clipping of an aneurysm followed by successful postoperative endovascular mechanical thrombectomy.

Independently, I have started numerous research projects and collaborated with osteopathic and allopathic medical students at various institutions across the country. In the following text, I provide highlights and implications of each article published, according to type of article.

Medical education (four articles): 1) Established a significant disparity in representation between allopathic and osteopathic physicians on editorial boards of neurosurgical journals. 2) Examined the educational literature regarding the current pandemic of neurophobia; analyzed published novel educational modalities that may be used to diminish neurophobia among medical students worldwide. 3) Provided simplified learning methodologies for health care students; provided an overview of the causes of the various brainstem vascular syndromes. 4) Provided students with a review of homeostatic neuroembryology and common congenital disorders, with illustrations.

Literature reviews (three): 1) Reviewed the variable vascular anatomy supplying the spinal cord, the clinical significance of the artery of Adamkiewicz; examined the various imaging techniques used to visualize this vessel prior to surgery. 2) Provided a simple three-step sequential algorithm (CHA2DS2-VASc, SAME-TT2R2, HAS-BLED) that clinicians may use as guidelines when managing patients with rate-controlled atrial fibrillation. 3) Analyzed the molecular biology of the cholinergic anti-inflammatory pathway and discussed the therapeutic implications of this pathway.

Case report (one): Published a case of an enterocutaneous fistula presenting 30 years after prosthetic mesh repair of ventral hernia.

Letters to the editor (two): 1) Considered the reproductive implications of human head transplantation. Dr. Sergio Canavero, at the forefront of head-transplantation research, responded to my letter with a commentary. The letter has been cited three times as of December 2017. 2) Considered the implications to osteopathic manipulative medicine of the *Science* article, “The Sacral Autonomic Outflow is Sympathetic.”

Ethics (one): In collaboration with a medical student from the University of Virginia, presented several ethical concerns of the human head transplantation procedure, focusing on bioethical considerations, psychological consequences, and reproductive implications. Our article initiated a discussion by the academic community on this topic, as our paper has been cited six times as of December 2017.

Humanities (one): Presented a case focusing on humanism in medicine.

I am pursuing a career in neurological surgery. I plan on doing a research fellowship after residency, with the intention of having a glioma biochemistry laboratory. I intend to spend 50 percent of my time on basic science research and 50 percent in the operating room.

RAJEEV DALAL

Obesity is a growing problem in the United States and many other countries. According to the World Health Organization, 41 million children under age five were overweight throughout the world in 2016. Many of these children will end up becoming obese as adults. As a future professional in health care, I will be responsible for managing patients with obesity and its plethora of comorbidities. Partly because I have a family history of cardiovascular disease and diabetes mellitus, obesity-related research is very important to me as these medical problems are often linked together.

Following my first year of medical school, I was given the opportunity to conduct obesity- and diabetes-related research with the National Institutes of Health/National Institute of Diabetes and Digestive and Kidney Diseases-sponsored Student Research Training Program at Vanderbilt University. My research consisted of investigating the dynamics and function of regulatory B cells (referred to as Bregs), which are capable of influencing inflammatory responses through endogenous production of an anti-inflammatory cytokine, specifically IL-10. My lab had previously investigated these cells in perigonadal visceral adipose tissue (VAT) and reported a protective role against obesity-induced inflammation and insulin resistance. One of the objectives of my new research was to verify that Bregs are also enriched in the thoracic VAT and could function as IL-10-producing cells, so we examined pericardial and periaortic VAT in comparison to perigonadal VAT. Another focus of the study was to determine when Bregs become seeded, or enriched, in thoracic and abdominal VAT. Understanding the seeding process could help guide future research in utilizing these time frames to target Bregs.

Following a few months of investigations, our findings revealed: 1) the B-cell compartment of both abdominal and thoracic VAT is enriched with IL-10-producing Bregs, and 2) the seeding process for Bregs occurs robustly between six and eight weeks of age in perigonadal and periaortic VAT, whereas this process occurs earlier in pericardial VAT. My research has contributed to the discipline of obesity- and diabetes-related research in immunology, because these observations can be used to guide future research targeting adipose IL-10-producing Bregs for the treatment of obesity-associated metabolic diseases. My work has been accepted by the American Academy of Allergy, Asthma & Immunology for poster presentation, and the manuscript has been submitted for publication. This project has shown me that medicine can be strengthened by the applications of research. And it is imperative to understand that basic science research lays the foundation for the clinical research to follow. Research findings are commonly used in

practice to guide treatments for patients, because research validates existing ideas of treatment. Interestingly, it also serves to challenge existing ideas, from which new ideas can be brought forth. This is why staying up-to-date on current research and recent studies is important.

As a soon-to-be osteopathic physician, I plan to use evidenced-based clinical research to corroborate the management for my patients. In fact, I have already begun to practice evidenced-based medicine. There was a patient who had a rare abdominal intercostal hernia, but due to obesity this was initially misdiagnosed as a common abdominal hernia. He was discharged for outpatient follow-up, but he soon had a complication of trans-diaphragmatic intercostal hernia that required urgent surgical intervention. Upon retrospective research, I found that, to date, there are only 20 documented cases of intercostal abdominal hernias, with limited insight on management. Based on the application of the research to this patient's case, we recommended that, even if stable, a patient with an intercostal abdominal hernia warrants surgical correction due to risk of complications and incarceration. In order to aid in future care, I helped prepare a case-report poster presentation for the American College of Gastroenterology's Annual Scientific Meeting in Orlando, Florida, in 2017. I also used such resources as UpToDate and Medscape to help guide care for the patient. I believe that both bench and clinical research are vital components in the medical field, because both have the potential to directly improve the management of patients.

REBECCA BROWN



One of the most challenging tasks as a medical student is finding the learning style that suits you best. Research has proven time and time again to be a tool that helps me understand further into a patient's disease process and how institutions can improve community health. That being said, the research that I feel has contributed most to my discipline is my research in medical education. I can say this confidently, because this research contributed to my own learning as a medical student while I was performing it. My project, "The Effect of Ultrasound Imaging on Student Learning of

Shoulder Anatomy and Landmarks," gave me insight into the ways that medical students are able to build their medical knowledge from the very basic subjects, such as anatomy.

We were curious to see if using ultrasound would help students learn to locate specific anatomic landmarks better than using a traditional atlas of anatomy or an anatomy app. Many of these landmarks (e.g., supraspinatus tendon, biceps tendon, T1 spinous process) are used to identify clinical problems, but in our literature review, we discovered that physicians were particularly bad at finding them. We sought to find a better way to teach identification and palpation of these landmarks, starting in the student's first year of medical school. We were also interested in teaching students how to use an ultrasound, since it is a modality that is increasingly being used in the clinical setting. If we could provide convincing evidence that students could be taught to use ultrasonography early in their clinical career, and that it would help them to better learn anatomy in the process, there might be an incentive for medical schools to start incorporating ultrasound in their curriculum. Not only would this help students better perform osteopathic manipulative medicine (OMM) and perform a physical examination, it would also give the students an alternate method to help them learn.

Our study concluded that ultrasound did, in fact, help students better identify and palpate the specific landmarks assigned to them. This was an exciting outcome due to the fact that it introduced a topic that other medical schools could explore in terms of inclusion in their curriculum. Medicine is a constantly evolving field due to the fact that researchers continue to be curious about improving the field's knowledge and clinical outcomes. Our study was designed to find better ways to train future researchers, which is why I'm so proud of the study. Although clinical research is of utmost importance, conducting research on medical education helps with the evolution of students who may eventually perform the clinical research that saves countless lives. I was thrilled when I learned that our study would be published in *JAOA—The Journal of the American Osteopathic*

Rebecca Brown

Association, enabling other professors and clinicians to read the study and decide if ultrasound was a possible addition to the curriculum at their institution. Reaching the desks of other osteopathic physicians is the first step in training the researchers of tomorrow.

I plan to continue to do research in any capacity possible during my career as an osteopathic physician. We are constantly taught that the body is a collection of many systems that work together as one. I feel that medicine is the same. Practicing clinical medicine is the goal of every medical student after graduating from medical school, but continuous research and learning is necessary to keep clinical medicine moving forward. Whether it is through case reports, community health projects, medical education research, or quality improvement projects, research has been a part of my medical career since the beginning. Research will be crucial at every stage of my career, as it will help me improve my practice and my care for patients.

GIOVANNI SANTORO



Opioid abuse is an urgent national health care concern. The substantial morbidity and mortality associated with the opioid epidemic has tasked clinicians, scientists, and government officials all with improving treatment options. Unfortunately, their progress lags behind the present clinical necessity, as the rates of opioid abuse and overdose continue to rise. Opioid replacement with methadone or buprenorphine is the current standard of care. These drugs have long half-lives and should theoretically curb withdrawal and prevent opioid relapse. However, their efficacy is limited, despite their first-line indication. Relapse is common, and long-term abstinence is rarely achieved. Furthermore, methadone and buprenorphine share the addictive liability and adverse-effect profile of the illicit opioids that they aim to replace! Clearly, improved strategies are needed.

In service of this effort, modern functional neuroimaging advances have enabled us to better characterize how opioids affect the human brain. Our neuroimaging research team was able to use this technology to study the natural course of opioid use. Using an animal paradigm, we acquired longitudinal 18F-fluorodeoxyglucose (FDG) positron emission tomography (PET) brain scans before and after opioid dependence and treatment. We modeled the human condition to characterize brain changes associated with opioid dependence and replacement therapy. At baseline, males and females had comparable brain metabolism. Following treatment, we found sex-specific variation in regional brain metabolism, notably in reward pathways. These changes were present during both spontaneous opioid withdrawal and replacement with methadone or buprenorphine. These data might help to explain why recent clinical reports indicate differences in therapeutic efficacy between males and females receiving opioid replacement therapy. In light of these data, we should strive to develop personalized treatment strategies for males and females to promote recovery and remission. Our results have been published in the Nature Publishing Group journal, *Neuropsychopharmacology* (Santoro et al., 2017), and our related National Institutes of Health R21 grant application is under review.

In the era of population medicine and value-based health care reform, we must strive for precision medicine. This begins with adequate representation of disease subpopulations in preclinical research. Surprisingly, a sex and gender bias exists in many biomedical research disciplines, namely neuroscience, pharmacology, and physiology. In these fields, the majority of drug development research is primarily conducted using male subjects. This bias has serious implications for women's health care and represents a serious

deficit in the scientific literature. It is surprising that this paucity of sex-variable inclusion prevails despite evidence that males and females absorb, excrete, and respond to drugs differently. In direct response to this issue and the current opioid epidemic, I believe that the research with which I am involved can significantly contribute to the advancement of medical knowledge. As I begin my career as an osteopathic radiologist, I plan to continue my neuroimaging research on drug abuse, dependence, and addiction.

I hope that the data we are generating can serve as a baseline for testing future opioid maintenance therapies and withdrawal treatments. Specifically, novel pharmacotherapies could be tested for their ability to normalize metabolic signatures and modulate receptor regulation. Preclinical microPET studies are enabling researchers to monitor drug kinetics, distribution, and associated biomarkers *in vivo*. Looking forward, the improved spatial resolution of hybrid imaging technologies, such as PET/computed tomography and PET/magnetic resonance imaging, will further our ability to correlate neurophysiology with anatomy, and, therefore, bridge preclinical laboratory findings with clinical applications. These data help us better characterize opioid dependence as a chronic disease, one with measurable and lasting physiological alterations.

In addition to providing biological information, this research can help us combat the social stigma associated with addiction. Although we as a medical community are aware that addictive substances alter brain neurochemistry, the general public and media continue to stigmatize these individuals as “addicts” with self-inflicted issues. Unfortunately, in our society, patients suffering from opioid dependence are more likely to end up being processed by the criminal justice system, as opposed to receiving the medical attention and resources they deserve. This is an unfortunate consequence of deficient rehabilitation infrastructure and funding. We are beginning to understand that addiction is a complex biopsychosocial issue. As functional neuroimaging research continues to show how addiction affects the brain, we should simultaneously direct our efforts to education and public outreach. As a medical community, we need to attend to the whole individual. We should find a balance between continuing research efforts, expanding treatment access, and improving social support. Only then will we be able to rehabilitate this suffering population and better address the opioid-abuse crisis in the United States.

BENJAMIN KRAMER



The forefront of modern medicine does not solely reside at the bedside; it is enriched and advanced by the unwitnessed behind-the-scene efforts of physician-scientists. With the massive innovation occurring in the field of medicine, physicians need to be as equally diligent in research as they are in patient care. As osteopathic physicians, we nurture the patient-physician relationship, and now more than ever, we also must cultivate our passion for advancing clinical medicine through research.

Cardiovascular research has been a fundamental component of my medical education. During the first year of medical school, I sought out avenues to get involved in research and begin contributing to the field in the hopes of having a greater impact on my future patients. The common thread that connected all my most interesting patients with cardiovascular disease, was the prevalence of poor dietary intake. Their diet typically consisted of high-fat food and processed refined carbohydrates, referred to commonly as the Western diet (WD). Worldwide, one of the most pressing matters in the field of cardiovascular medicine is the large impact of diet-induced metabolic disease. Despite the massive U.S. public-health campaign to educate the nation on the impact of diet on cardiovascular health, the underlying scientific understanding of cardiovascular diseases is still greatly lacking.

The lab of Dr. Maria Sepulveda, a vascular physiologist, fit my clinical interests and provided all I desired in a research and mentorship experience. My research aim was to understand the impact of WD on the cardiovascular system. Ultimately, my work greatly added to the present literature on cardiovascular disease in the female population, and it elucidated a potential mechanism associated with cardiovascular disease in diabetics. Working with Dr. Sepulveda, I was able to demonstrate that short-term WD impedes cardiometabolic protection in a female rat population. Additionally, we demonstrated an association of lysine acetylation in diabetic cell lines and in vivo in the vasculature of female rats. Collectively, these results were the first to demonstrate the impact of short-term WD on a female rat population and to identify lysine acetylation as a post-translational modification that occurs in the vasculature of female rats. My work led our lab to establish a new dietary model in an understudied population and added to our knowledge of cardiovascular disease. Furthermore, because of the results of my research, I make sure to counsel my patients more thoroughly when discussing their diet. Despite the focus of my research being on rodent populations, the findings contain important warnings about food consumption that are clinically relevant and applicable to patients.

Benjamin Kramer

As an future osteopathic physician, I am charged with focusing on my patients' entire well-being. This complete approach to patient care is enriched by my basic science research, and it challenges me to provide even better care. Coming to understand research as this omniscient force influencing the way we practice health care, it is imperative to continue participating in research. During the remainder of medical school, I will continue working on my established research endeavors. My passion for cardiovascular medicine and my appreciation for surgical care have led me to pursue a career in surgery with the intention to become a cardiothoracic surgeon. Driven by my passions for patient care and research, I hope to attend a university-based residency program and continue researching the impact of cardiovascular disease in my patients. There is currently an explosion of innovative techniques and tools in cardiothoracic surgery. I want to be a part of the generation that facilitates these techniques and advancements in surgical care while ensuring patient safety. As an academic surgeon, clinical research will be imperative in the development of my patients' future benefits and the overall advancement of the field.

JAMES DOCHERTY

During medical school, I have worked on several investigations in different fields, but one matter connects them all: osteopathic manipulative treatment (OMT). All of my projects aim to explore the use of OMT, including for such applications as exercise recovery and Parkinson disease. OMT is underutilized as a treatment modality, and providing sound research results to support its use and effectiveness will benefit both the osteopathic and allopathic worlds. I have focused my OMT research efforts in the education and clinical settings.

Exploring the use of OMT in sports medicine and exercise recovery is logical and promising because of its involvement with the musculoskeletal and lymphatic systems. I investigated the impact of the pedal lymphatic pump technique on exercise recovery. Although results of the pilot study was inconclusive, it has opened avenues for future research integrating different techniques. Another project I am working on examines the effectiveness of different forces used while performing various lymphatic pump techniques. As this project is ongoing, it's potential impact is unknown. However, the discovery of an optimal force for lymphatic techniques could change the field, including how these techniques are taught to students. Yet another focus of my research concerns the effectiveness of small-group OMT learning, as well as osteopathic medical students' impressions of OMT regarding its use in clinical clerkships and future practices. This study has the potential to change methods used for OMT education in the future and to increase the number of osteopathic physicians practicing OMT. The final research endeavor I am involved with is investigating the effects of OMT on symptoms of Parkinson disease, including sleep disturbances, muscle rigidity, balance problems, and fine motor detrition. Early data suggest that OMT can significantly improve these symptoms and quality of life for patients. These findings and those of future studies could change the treatment guidelines for Parkinson disease and benefit millions of people affected by this disease.

As a future osteopathic physician, I plan on continuing my interest in OMT research and implementing OMT into all aspects of clinical medicine. I also aim to research its effects on multiple disease processes and common ailments. I'm particularly interested in cranial field manipulation and its impact on migraines, tension headaches, and cluster headaches. Not only do I plan on performing research myself, but I also keep up-to-date on the latest studies, OMT and otherwise, exploring better treatment modalities and guidelines for conditions I will see as a physician. Medicine is a constantly evolving field

James Docherty

propelled forward by research. The importance of research investigations is immense and immeasurable. Passionate scientists, physicians, and researchers are invaluable to furthering medicine and improving patient outcomes.

MELINDA ARTHUR



Stroke, like many diseases, results from an overlap of dysfunction of the five osteopathic models: respiratory-circulatory, neurological, metabolic-nutritional, biomechanical-structural, and behavioral-psychosocial. Following embolism in the brain, there is an obstruction of the circulatory system, which leads to hypoxia of tissue. The respiratory system can no longer supply oxygen to the brain. Hypoxia then leads to metabolic dysfunction and damage to the nervous system. As a result of termination of neural impulse, there is dysfunction to the musculoskeletal system that leads to loss

of biomechanical connection. The end result of this domino effect is brain death and temporary or permanent paralysis.

The above explanation incorporates the first four models of osteopathy. How does the fifth model, behavioral-psychosocial, come into play? I was fortunate to be a part of the radiology-stroke research group led by William Culp, MD, and Aliza Brown, PhD, with collaborator Micheal Borrelli, PhD, at the University of Arkansas for Medical Sciences (UAMS) College of Medicine. We are one of only two groups in the world to study the variation of the Circle of Willis in the rabbit embolic model in connection to efficacy of stroke drug therapy. The only current Food and Drug Administration-approved drug treatment for stroke is tissue plasminogen activator (tPA), and patients qualify for it only if symptom onset has been less than three hours. Due to the time delay, fewer than 5 percent of the 800,000 stroke victims a year receive treatment.

Our stroke research group investigated dodecafluoropentane emulsion (DDFPe) for the ability to provide reperfusion during states of ischemia prior to tPA thrombolysis in the rabbit stroke model. We discovered that DDFPe extended the window for tPA stroke therapy from three to nine hours after stroke symptom onset. The combination of DDFPe+tPA is currently in phase Ib of clinical trials at the UAMS. Current clinical trials involving DDFPe include “stopping the clock” by providing reperfusion not only to patients suffering from acute ischemic stroke, but also to patients with sickle cell anemia, myocardial infarction, traumatic brain injury, and glioblastoma.

After finishing my master’s thesis defining the tissue pharmacokinetics and safety of DDFPe with Howard Hendrickson, PhD, and outlining the benefit of DDFPe/tPA drug therapy in treating anterior stroke versus posterior stroke in the rabbit embolic model with Aliza Brown, I was accepted into the inaugural class of 2020 at the New York Institute of Technology College of Osteopathic Medicine at Arkansas State University (NYITCOM A-State). This is Arkansas’ second osteopathic medical school. Among all 50

Melinda Arthur

states, Arkansas is ranked 48th in health, 46th in number of primary care physicians, and 5th in stroke death. Our school was founded with a goal of providing doctors to the delta regions of the state, where many residents lack medical care. Stroke death is also prevalent in these delta communities, where, in addition to decreased medical care, there is decreased access to educational resources on nutrition and grocery stores. I worked with my former boss, Aliza Brown, to define health demographics, comorbidities, and access/distance to stroke treatment centers in these communities.

While the demographics have been defined, the environmental and social circumstances leading to disparities in health determinants and poor health outcomes in these regions are unknown. As part of my evidence-based medicine certificate, under the guidance of Carol Brenner, PhD, I hope to define the social circumstances related to stroke deaths and methods of improving access to care and resources. I believe that through changing behavior and environment, we can start to remove many comorbidities of stroke, such as hypertension, diabetes mellitus, and obesity. I am pursuing a career in interventional radiology and hope to further define cerebrovascular anatomy related to optimal stroke drug therapy.

My inspiration as a future osteopathic physician-scientist is found in Dr. Culp's words referring to the potential of DDFPe in treating stroke victims: "We're talking hundreds of thousands of folks each year." There are unexplored avenues and health disparities affecting numerous patients in Arkansas. I believe that by investigating novel therapeutics such as DDFPe and by developing environmental and social solutions to behavioral dysfunction, we can close the gap in stroke therapy. I hope to make a difference in our state through exploring osteopathic philosophy, which reflects Hippocrates concept that "our natures are the physicians of our disease."

ALI BOKHARI



My brothers and I were fortunate enough to have the comfort of basic health care, access to public education, and full scholarships to colleges that opened a world of opportunities for us. However, the absence of these basic privileges from the lives of my parents, who escaped from poverty and religious persecution, instilled a sense of obligation to those less fortunate. From a young age, I have been gripped by the prevalence of health, education, and socioeconomic disparities. My commitment to public service has been shaped by several experiences, including a particularly

difficult encounter that has left an indelible impression on me and will be a motivating factor throughout my career.

A few years ago, my friend Jane, an unbelievably talented, smart, and extraordinarily accomplished person, was raped. You hear about rape on the news, but this was the first time I learned about a friend who went through that unimaginably horrific ordeal. Hearing her testimony, and those of many other survivors, elicited cycles of sorrow and anger, but even more confusion and helplessness, because of my powerlessness in the face of this silent epidemic.

Jane did not feel the situation left her powerless. Rather she was filled with purpose, and I knew this work had to become my work as well. After days of research, I learned that an inconsistent patchwork of state laws had resulted in sexual assault survivors facing hurdles regarding the status of their sexual assault evidence-collection kits. The Violence Against Women Act requires jurisdictions to offer medical forensic examinations to sexual assault survivors, but the kit storage policies vary across jurisdictions. Survivors are sometimes given no information about the testing, results, or destruction of their kits, which can often be charged to them, and they are not guaranteed protection of their rights. To require survivors to submit requests for the preservation of their kits places an undue burden on them, with consequences to their mental health and recovery.

Jane worked to get the Survivors' Bill of Rights Act passed through Congress to address these challenges. However, the federal government is limited in its ability to change law-enforcement practices at the state level, thus requiring individual state legislation. Since sexual violence is a serious public health issue that should be addressed by the concerted efforts of the medical community, the best way I thought to use my platform was to have the leaders of this community, and the largest physician organization, commit their resources and influence. After months of writing, I crafted policy for the American Medical Association (AMA) that would direct its lobbying power and

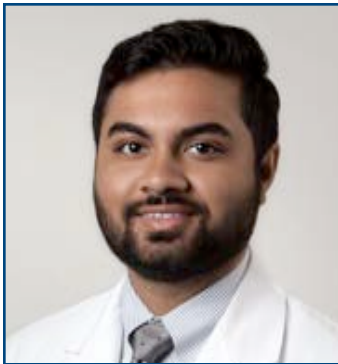
embodiment of over 190 state and specialty societies to recognize this pressing public health issue, advocate for state adoption of these standards, and collaborate with federal agencies to develop better practices for the treatment of survivors.

What began as a meaningful conversation among individuals swelled into a chorus of ideas and an outpouring of support. An undeterred coalition of medical students from across the country came on board and banded together in recognition of the far-reaching legislation being proposed. The momentum of regional and state support carried us to the final MSS vote, with widespread endorsement, positive evaluations by AMA staff, and strategically prepared rebuttals for debate. On the day of the vote, a grand hall brimming with a thousand medical students erupted to a standing ovation as the policy passed with overwhelming support.

Months of calls and meetings have led to consideration of the policy at the final vote in front of the entire AMA voting body in a couple of weeks, as of this writing. With a much larger team joining me at the helm, this large coalition of medical students and physicians is tactically garnering endorsements from the vast number of specialty and state societies ahead of the vote. Soon, I hope to be able to share with Jane and others that the full force of the physician body is directing its power to work with the federal government, state governments, and stakeholders to contribute to reducing the burden on sexual assault survivors.

This experience has shown me the potential of taking an idea that brings people together and launching it in the form of policy objectives, fueled by a just cause and aggressive persistence, to serve as a vehicle for widespread impact. I hope to continue working on more tangible items of change that reduce health, educational, and socioeconomic disparities, and I intend to use experiences like this to become a more capable public servant and advocate and a physician working in public policy and government.

SHIL PUNATAR



Toward the end of each day, I take a few minutes from studying to call home and check on my parents and to see how their days went, as well as to ease my mother's nerves by telling her I am getting enough sleep and eating proper meals. During most of the conversations, I have one ear on the phone mumbling short responses to my parents, while my attention flutters over class material and upcoming exams. One night, however, my parents seemed to talk at length about how they went to multiple grocery stores looking for saffron for our home and to send to relatives in India.

"We have Prime, don't we?" This was the response I gave to my parents—naively telling them about the convenience of Amazon Prime so the conversation would end. On the other end, both my parents laughed at my comment, as if I had just said the most ridiculous thing, to which my father commented, "You need to understand..."

The saffron spice is one of the most coveted in all of Indian cuisine, which I never understood because while I grew up we always had a small container of it in the fridge, right next to the Kraft Singles. My mother explained that in her home in India, saffron could be afforded only during religious events, when two or three tiny threads were used to flavor milk for an entire family. My father laughed about how he had never tasted saffron until a relative from America brought it to his mother, from which point on he understood its significance in Indian culture as a sign of "providing for your community" when shared with one another. For years, my parents have purchased one container of saffron, carefully splitting it into several quarter-sized containers to send to various relatives in India for the holiday of Diwali.

An hour into this phone conversation, I was finally giving my full attention to my parents—realizing I had completely obliterated the value of something near and dear to so many in my community. I played back this encounter with my parents several times in my head. At first, I considered it to be a history lesson on something my parents wanted to talk about. Thinking further and considering my original impressions on the topic, I realized it was not saffron my parents wanted to tell me about but, rather, they wanted to teach me about perspective. Until that evening, my thoughts on my educational process were to keep my nose to the grindstone, learn material, and take tests efficiently. This mindset was completely missing an integral aspect of the practice of medicine. To an extent, I was ensuring that I could fit knowledge in my head but neglected the reciprocal relationship between doctor and patient. While mastery of material is one component,

understanding the importance of medicine, namely the role it plays in people's lives, and the interactions it creates is what embodies the art of medicine.

The saffron itself was not necessarily important, but the interaction it represented—the happiness in being able to share it and to create something of it for others—was extremely important. While I have not yet been in clinical practice, my perspective has changed to try to better understand the affect that each patient encounter plays in the lives of those involved.

It is not about the convenience to me, as suggested with the use of Amazon. Rather, as a student doctor and future physician, I need to better understand the significance of each encounter for the patient. I need to take it one step further from, “Did I check off all the boxes?” to considering such questions as, “What does this diagnosis mean for a patient?” “How will this impact the patient?” “What solace do the patient and I aim to achieve from this encounter?” While still learning, I hold this one lesson in high esteem. As a student and community member, I will strive to not only learn as much as I can to provide adequate care, but to understand the lasting impact care entails in the lives of others, while also telling colleagues of these impressions. Many times, I am asked where I see myself in the future. But as a future physician, I am also starting to consider where patients would want to see themselves.

NATALIE N. NEGRON



The rigors of medical school are undeniable. It takes a toll on your physical, mental, and emotional health. In order to keep my sanity through it all, I made an important choice to follow some wise words that had been shared with me during my time as an undergraduate student: “Immerse yourself fully in whatever you do, do as much as you can, and don’t ever place limitations on yourself.” Remembering these words when facing the challenges of being a medical student has kept me fully engaged and focused on my goals.

When I started this journey, I knew that I wanted to make the most of my time as a medical student. I wanted my actions to have a meaningful impact on my school, my community, and the osteopathic medical profession. I constantly asked myself, “How can I enact the change I seek? How can I better my program? How can I better the experience of medical school and the future profession I have chosen to enter?” In the first few months of medical school, I decided to take a chance by leaping outside my comfort zone and running for student government. It turned out to be the best decision I could have ever made. Through my roles in student government, I have found a passion for student leadership and advocacy. While I have had several responsibilities serving in this capacity, I have also been empowered to move beyond what is required and to advocate on behalf of the issues that I am most passionate about, including political issues, medical education, student debt, domestic violence, and human-trafficking awareness. As an advocate, I have met with lawmakers and representatives from Congress to discuss ways to address these problems and other issues affecting osteopathic medical students. I have participated in programs on medical education and met with student leaders from other schools for collaboration. I have partnered with non-profit organizations to lead volunteer initiatives that raise funds for victims of domestic abuse and human trafficking.

Even as I write this, it is difficult to select just one project in which I have needed to be fully engaged, because to be an advocate, one must be fully engaged at all times. But of all the projects I’ve had the unique honor to be involved with, the initiative that I derive the most meaning from and consider my greatest contribution to my community is empowering my fellow students to serve as advocates and leaders. From my mentors and role models, I have greatly appreciated the belief that they have placed in me. It is because they have believed in me that I have felt inspired and motivated to accomplish my goals. As a direct consequence of this, I have dedicated my time as a student leader to do the same for others.

Natalie N Negron

Over the past few years, I have empowered club leaders to take their organizations to the next level, to start new interest groups, and to turn clubs that were previously on probation into some of the most successful and active groups on campus. I have empowered my fellow classmates to share their stories of success and struggle with the rest of the osteopathic community by writing for national publications. I have empowered student leaders to participate in community volunteer initiatives and to promote mental-health awareness and open, honest discussions. The joy I feel from empowering others to serve as advocates and leaders is matched only by the joy I feel for the art of medicine and caring for patients. But staying engaged and focused hasn't always been easy. Medical school does not stop when life throws you curveballs. It demands the best of you—all of you—even in the midst of chaos. Knowing that I have found a calling in advocacy and leadership has kept me moving forward when I've come across a hurdle.

My experiences with empowering others have made me a better human being and will make me a more compassionate and understanding osteopathic physician. As such, I hope to continue serving as an advocate when I am physician. I will always advocate for patients, but I also plan on empowering my patients and their families to serve as advocates. I recognize that medicine isn't just about the disease, it's about the patient as a whole, the patient's family, and how all of their stories come together in one experience.

FRANCIS ESSIEN



I imagine for a moment that you just had a long day and everything went wrong. Having completed my work in the lab for the day, my mentor met me outside before we adjourned. I was dejected and ashamed that I had botched an experiment and hindered the project for several weeks. In that moment, my mentor conveyed an important lesson to me in a very simple message, “We will figure it out.” In that moment, it struck me that I had not grasped the importance of what I was doing before. I was so overly concerned with my resume and with the advantage that research would grant me, that I never

stopped to understand the depth of what lay in front of me.

As a future osteopathic physician, research is undoubtedly an important aspect of my education, for it allows the osteopathic principles learned in classes to resonate even further. On a daily basis, we as osteopathic medical students are exposed to techniques that although credible, lack a full scientific evidence-based explanation. Hence, in order to further advance and comprehend osteopathy, I must conduct research. Research to a future physician is not a separate entity from the clinical science that we strive to learn, but rather it is the application of that science. It is not a static subject that can be understood as a step-by-step process, but rather it must be approached as a fluid entity. It is in a constant flux with new possibilities that may present at any moment. It is crucial to be open to new questions that arise along the way. The constant assessment and review of the research work will ultimately lead to new variables, hypotheses, theories, and pertinent data. The work completed in the laboratory is validated in clinical practice by physicians, ultimately leading to evidence-based medicine that benefits patients.

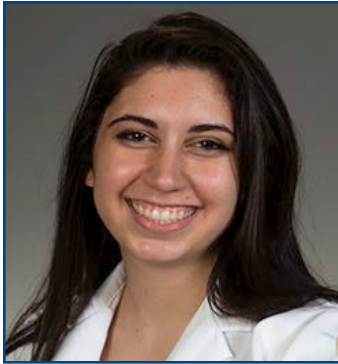
The purpose of research is to provide the medical community with innovative and high-quality information. High-quality research must be replicable, valid, and examinable by one’s peers. If one’s peers cannot account for the relevance of the work, then the results cannot be deemed appropriate to be distributed within the larger body of scientific knowledge. Thus, by working together and by evaluating and critiquing research results, we are able to work as a team to address the world at large.

The basic axiom of a physician is delivery of efficient care with a minimal risk-to-benefit ratio for all patients. The treatments that we utilize on a daily basis must be constantly refined. The process by which improvement takes place is research. However, a problem that has yet to be resolved regards the time lags in research dissemination. Specifically, the lengthy transition of research results into clinical practice plagues the global health process, resulting in losses that might have been prevented. There is a disconnection

between those who acquire evidence and those who implement the evidence. The problem is augmented by the separation of clinical science from laboratory science. The division leaves neither to prosper, and progress is hampered without just cause. Thus, future physicians and researchers need to be aware of this gap and try to close it.

In conclusion, research is that ever-elusive “why” that scientists and physicians alike pursue with the hope of an answer. The purpose of research is to address those fundamental problems that affect the communities around us. My role as a physician is to serve the community at large and deliver the most effective forms of treatment possible. In order to accomplish that goal, I must investigate better methodologies, and research allows for that to happen. The empirical nature of my research allows me to deliver excellent care to my future patients. By linking the clinical experience and evidence-based medicine in the laboratory, scientific research ultimately grants to future physicians improved training and enhanced insight into patient care.

CHRISTIANE MHANNA



Osteopathic physicians practice the principles of holistic medicine, which includes a recognition of the importance of research. As osteopathic physicians, we are responsible for our patients' health, so we must stay up-to-date on current research, techniques, and guidelines. It is most imperative that osteopathic physicians continue to read and even embrace clinical research. Through my unique experiences with research, I have grown as a learner and ultimately as a future physician.

Prior to matriculation into medical school, I was a biomedical engineer specializing in electrical engineering. I joined the biomedical engineering research team at the Cleveland Veterans Affairs Medical Center. With a research focus on providing sensory feedback to amputee patients, my roles included programming and testing software to select appropriate stimulation parameters that followed human safety guidelines, as well as collecting and analyzing data from clinical experiments to examine improvements in tactile sensation over time. I will never forget the satisfaction of watching a patient's face light up as he felt sensation in his residual limb while his wife shed tears of joy. "This is the first time I have felt my wife's hand since the accident," he said to me. My goal in pursuing a bachelor's degree in biomedical engineering was to not only understand the engineering principles underlying the daily equipment used by physicians and their patients, but also to help bridge the gap between physicians and engineers.

After graduation, I worked at the Cleveland Clinic as a biomedical engineering researcher. I learned how to implement the acoustic radiation force impulse (ARFI) ultrasound technology to examine the transverse carpal ligament in human subjects. My other roles here included collecting and analyzing data from clinical experiments to examine the morphology and pathomechanics of the carpal tunnel and its contents.

Since entering medical school, I have had the great honor of presenting my research internationally in Venice, Italy, for my project titled, "Obesity and Arm Circumference as Predictors of High Blood Pressure in Female Teenagers". Cardiovascular conditions, such as high blood pressure, coronary heart disease, stroke, and heart failure, are the leading causes of death worldwide. Within the past decade, the prevalence of obesity has dramatically increased. Obesity is leading to high blood pressure in many adolescents and young adults today and is one of the strongest predictors of hypertension. Thus, it is crucial to examine the health statuses of young people to help them avoid the risks of obesity and cardiovascular disease. A total of 223 female students participated

in my study. Findings found a correlation between weight and systolic blood pressure, as well as between arm circumference and systolic blood pressure. Most importantly, an arm circumference greater than 29 cm was found to predict high systolic blood pressure. Thus, a simple screening test, such as arm circumference measurement, can be of value to the nursing staff and allied health care professionals in schools to screen adolescents at risk for the development of cardiovascular disease at an early stage. Such a test would be useful for prediction of high blood pressure and early intervention in the office or school setting.

My interest in pediatrics increased throughout my years as a medical student. With my prior biomedical engineering background and my interest in obesity and adolescent health, I fell in love with the combination of the two through pediatric cardiology. I recently became involved in a retrospective study at the Cleveland Clinic regarding percutaneous pulmonary valve implantation in the native right ventricular outflow tract. Percutaneous pulmonary valve implantation (PPVI) has become a standard procedure performed in selected patients who have right ventricular to pulmonary artery conduit dysfunction. The application of this procedure has been expanded to include patients with native pulmonary valve regurgitation as a result of a previous surgical procedure. In our retrospective study, patients' demographics and cardiac diagnoses were recorded. Clinical symptoms before and after PPVI were compared. Each patient's cardiac catheterization procedure and complications were reviewed. None of the patients developed endocarditis. Follow-up echocardiogram showed a statistically significant decrease in peak gradient across the pulmonary valve. All patients experienced a statistically significant decrease in pulmonary valve regurgitation at follow-up, with low re-intervention rates at midterm follow-up.

Research has been an important part of my life and career development. I plan to continue researching and, hopefully, make a difference that will positively impact future lives. As physicians, our work is limited by the patients we come across. But as researchers, we pave the way for positive change in the lives of future patients.

RYAN PAULUS



In the midst of young children playing health education games, parents tuning in to listen to health advice, and the medical student to my left collecting a blood pressure, I thought of everything that made this special day possible. The long hours of planning, writing to donors, contacting local health professional schools, and promoting the 2017 Bobcat Care Fair in the community had all paid off. I reflected on the young mother who had profusely thanked me for the free “Health is Primary” t-shirt and handouts, the teenage girl with a family history of diabetes who was very appreciative

for the free glucose screening, and the primary care resources I gave to a father with untreated high blood pressure and no primary care physician. I watched my classmates counsel patients and embrace the work we were doing. I stood there and thought, “This is what it is all about, this is why I am here, this is what I have been called to do.”

Although I have been involved with a number of community outreach and service projects during medical school, this is the one that made the biggest impact on the community and myself. This was the first year that the Bobcat Care Fair was held in an underserved area of Columbus, Ohio—an area that the Health Resources & Services Administration (HRSA) classifies as a “medically underserved population.” As president of the family medicine club, I was determined to grow and expand our Care Fair from the previous year to reach more people in need. To help achieve this goal, I applied for grants to cover the cost, contacted the Health is Primary campaign (of Family Medicine for America’s Health), worked closely with faculty and students in coordinating and planning, and distributed promotional flyers in the community. I reached out to Ohio Northern University Raabe College of Pharmacy and Ohio University’s Physician Assistant Program for interprofessional collaboration, and they were excited to join us and contribute. Through these efforts, we were able to offer blood pressure and blood glucose screenings, education on skin cancer and free sunscreen, promotion of the Health is Primary campaign, and resources on how to connect with a primary care physician. We also had educational stations on healthy food choices, healthy activity levels, basic hygiene, and overall healthy lifestyle.

During the Care Fair, it was inspiring to watch my classmates come together with pharmacy and physician-assistant students to achieve the common goal of providing care for the underserved. In addition to the Care Fair reflecting positively on the osteopathic medical profession, it demonstrated the community impact that we can have as medical students and the good that we can accomplish when we work together. Personally, the

Ryan Paulus

experience gave me motivation to seek more service opportunities, and it has helped lay a foundation for me to build upon when planning similar events in the future. When I learned that the 2018 Bobcat Care Fair retained all the features we had added last year, I was extremely happy.

As an aspiring osteopathic family physician, continued involvement in community service events is an important part of my career. Through working with the underserved population at the Bobcat Care Fair, I gained a deep appreciation of the value of helping those in need. It has reaffirmed my desire to dedicate my future practice to helping the underserved populations of our country, whether it is through mission trips or local involvement in the community. As I continue advancing through my career, service will always have a significant role as I strive to make a difference in the lives of my future patients and the community where I provide care.

A mentor once told me to find that activity that “fills your glass.” For me, the acts of community service and helping others fill my glass. The energy level and the excitement that I have while serving reminds me of why I am going into the medical profession. I have learned that there is nothing more fulfilling than knowing you have made a positive influence on someone. Having a patient of mine smile, offer a hug, or even say a simple “thank you” makes all the long hours more than worth it and confirms that I made the right decision to attend medical school.

LACY BRAME



Prior to enrolling as a student at the Oklahoma State University Center for Health Sciences College of Osteopathic Medicine, I was a master's student in the Department of Biostatistics and Epidemiology at the University of Oklahoma College of Public Health. Additionally, I served as a graduate research assistant in the Research Design and Analysis Center, and I participated in basic sciences research alongside both Dr. Laura Beebe and Dr. Lurdes Queimado. Although most of my course work and graduate research-assistant responsibilities required me to conduct statistical analy-

ses and manipulate large datasets, I relished the opportunities I had to go out into the field and interact with individuals while doing public-health research.

In one research project, my principle investigator and co-worker were evaluating effects of the American Indian genetic heritage on the metabolism of both traditional tobacco products, as well as electronic nicotine delivery systems. I attended various American Indian gatherings, including Pow Wows, with my co-worker in order to assist her in participant recruitment for her dissertation. The results of this dissertation and the papers that our team generated from our findings revealed how American Indians metabolize nicotine differently than people in other demographics. Specifically, we saw that American Indians in Oklahoma had variations in the cytochrome P450 (CYP) genes responsible for the metabolism of nicotine. While attending these events, I not only learned about the types of tobacco products individuals chose to consume, but also about how drastically health behaviors differ among cultural strata and how genetic variation offers insight into how American Indians in Oklahoma may be predisposed to nicotine dependence.

A few semesters prior to completing this data collection, I had taken a class called "Epidemiology and Prevention of Diabetes." In this class, I was taught that American Indians had an extremely high prevalence of diabetes mellitus and associated complications, such as peripheral vascular disease and diabetic retinopathy. It was not until attending the Pow Wows, however, that I understood why those statistics are so high. In addition to observing tobacco usage habits at these events, I also noticed that most attendees consumed processed food, sugar-sweetened beverages, and refined carbohydrates. It became clear to me while venturing out to remote places in Oklahoma that I was actually in the presence of a "food desert," with very few nutritional options available to residents of these areas, including the American Indians who attended these events.

Lacy Brame

These nutritional inequities are one reason for the high prevalence of diabetes among American Indians in Oklahoma.

My motivation to pursue medicine is complex, given my past research experiences. I care deeply about reducing chronic diseases, such as diabetes, and reducing rates of tobacco usage across Oklahoma. Although my objective while conducting epidemiologic field work was to study tobacco use, I additionally observed how an individual's environment—such as lack of access to health care, fresh fruits, vegetables, and other things I take for granted—contributes to health outcomes. As a result of these observations, I realized that improvements must be made to health care access in rural Oklahoma and to health research and dissemination of research findings to these communities. Research can lead to better policies, improved education, increased access to resources, and greater understanding of the cultural diversity that contributes to disease, health, and addiction.

While I have been educated and trained in clinical medicine and epidemiology, the true value of these educational experiences come not from their distinct disciplines, but instead from making inferences and connections between the two fields. For example, trends I have observed on a macroscopic level have prompted me to investigate individual behaviors that potentially contribute to these trends. Patterns that I observe in my patients will lead to new research questions that might further advance our knowledge of disease prevention. My goal as an osteopathic physician is to not only treat the individual patient, but also to look upstream of the disease and use my clinical and epidemiological skills to identify potential routes of prevention. I believe that my greatest value as a future osteopathic physician is derived from my motivation to cohesively use my research and clinical training to improve the health of my patients and, consequently, improve the public health of Oklahoma.

BRITTANY BOLT



Life with chronic illness due to Marfan syndrome was the breeding ground for a desire to study medicine during my childhood. As an undergraduate student, my employment in a Neuro Trauma intensive care unit led to the birth of a passion to understand the science behind nerve damage and restoration of function in the injured human nervous system. Currently in the United States, millions of people suffer from the financial and physical burden of chronic pain. As such, improvements in therapeutic treatment for chronic pain would prove advantageous to public

health. The last 20 years of research have provided only small advances in the development of new effective analgesics.

Current strategies for pain management include three major classes of analgesics: opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and local anesthetics. In the opioid family, morphine serves as the prototypical analgesic, acting on mu opioid receptors of the primary sensory neurons. However, morphine is not universally effective and often leads to constipation, nausea, sedation, respiratory complications, and addiction. Drugs in the NSAID group treat pain by blocking the production of inflammatory mediators, prostaglandins. Cyclooxygenase (COX) inhibitors also provide analgesia, but with pronounced gastrointestinal disturbances, including bleeding, and cardiovascular complications. Local anesthetics lead to short-lasting analgesia via nonselective inhibition of sodium channels in excitable tissues. Their ability to block all sodium channels, however, causes complete anesthesia (i.e., lack of sensation) in the treated tissue. Furthermore, local anesthetics can lead to dangerous generalized effects in the central nervous systems (CNS). These effects are caused by inhibition of common mechanisms of electrical impulse conduction and depression of central inhibitory tracts in the CNS.

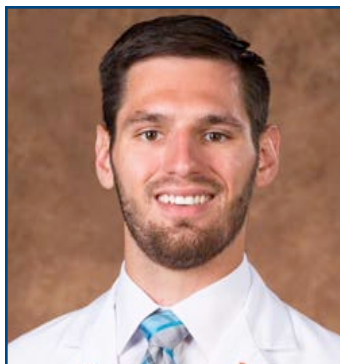
The limited efficacy and the adverse effects of current analgesics in treating chronic pain demonstrates the need for further phenotypic characterization of primary sensory neurons that are involved in the development of chronic pain states. That is, primary sensory neurons are heterogeneous in regard to classifications of morphology, function, and neurochemical phenotype. Understanding these classifications and the changes that occur in inflammation will lead to more targeted and, possibly, more efficacious treatment for patients with chronic pain. As such, phenotypic and molecular characterization of nociceptors during painful inflammation is a current focus of study. Pursuing this characterization will require identification of protein changes in expression within specialized nociceptive neuronal populations.

Brittany Bolt

My doctoral research explored the alteration of glutamate metabolism in the dorsal root ganglion during the development of acute and chronic inflammatory pain states. The primary purpose of this study was to examine the distribution of the enzyme aspartate aminotransferase (AST) in rat dorsal root ganglia (DRG) and to determine its role in nociception and its potential as a target for analgesic therapy. The temporal expression of AST in the DRG following peripheral inflammation was assessed using behavioral studies, florescent microscopy, and quantitative image analysis. The expression of AST in the sciatic nerve and hindpaw skin were also explored using florescent microscopy. The results of my work indicate that following inflammation, increased AST was synthesized in the DRG neuronal cell body, then transported along the peripheral nerve toward the peripheral terminal. The results also indicate that in the peripheral terminal, the AST enhanced glutamate-induced peripheral sensitization following inflammation, leading to analgesia through the attenuation of glutamate-induced nociceptive behavioral responses in rats. Lastly, with clarification of the role of AST in peripheral inflammation, it is rational to suggest that AST appears to be a viable target for further study in the development of novel therapeutic targets for inflammatory pain. My research demonstrates that alteration of glutamate metabolism may provide a novel means of treatment for patients with chronic pain due to inflammation. This treatment would be an alternative to using highly addictive opioids.

Following medical school and research residency, I will conduct research in the hospital setting and take the newest clinical discoveries in neurology from the lab bench to my patient's bedside. Training as a graduate teaching assistant has prepared me to fulfill my goal of serving as a faculty member at a medical school and as a director of clerkship. My long-term goal is to serve in academia as a physician-scientist, which will allow me to use my many years of experience in shaping the environment of education for medical and graduate students. It is also my goal to advance science education within the disadvantaged student population in which I had my beginnings. I will accomplish this goal by volunteering as a mentor with the intention of developing a scholarship fund for DO/PhD minority students.

MATTHEW SIMS



Research plays a vital role in the validation of existing medical practices and in the discovery of new ones. However, it is important to realize the impact that these findings have on a patient's prognosis. For example, the Food and Drug Administration approved tissue plasminogen activator (tPA) for use in patients suffering from acute ischemic stroke just months after the publishing of the ground-breaking trial of tPA by the National Institute of Neurological Disorders and Stroke (NINDS). With the modern surge in evidence-based medicine, physicians are increasingly dependent

upon quality research, such as the NINDS tPA trial, to guide their health care decision making in the best interests of their patients.

As an aspiring physician, I believe that it is my duty to my patients to be involved in conducting research and staying current with new studies throughout every stage of my career. It is this belief that led me to seek out available research opportunities at Oklahoma State University Center for Health Sciences College of Osteopathic Medicine and to strive to grow the institution's research community for future students. These pursuits have allowed me to expand my medical knowledge in a variety of disciplines through exposure to thousands of systematic reviews, clinical trials, and observational studies. During my short time as a researcher, I have discovered a passion for expanding the evidence that forms the basis of my profession.

Much of the public views research as men and women in laboratory coats examining mice and culturing bacteria in an attempt to discover new cures. Although this view is not entirely misguided, it is only a small part of a much bigger picture. Even many physicians possess a limited view of research that consists mostly of clinical trials and observational studies. However, the hierarchy of evidence reaches its peak with pooled-effect outcome summaries in the form of systematic reviews and meta-analyses. Such reviews implement data across multiple studies with large sample sizes and ultimately result in the best overall conclusion to advise for or against specific medical practices. The researchers who perform these reviews are reliant upon the quality of many previous studies and the methodological integrity of their own study to ensure that their conclusions are standardized and unflawed. This is the specific area of research in which I have devoted most of my time and effort.

The integrity of a study can be influenced at any stage of its development by many different factors, including the lack of standardization in reporting results, financial conflicts of interest, reporting bias, outcome switching, and failure to register clinical trials.

When a study's conclusions are swayed by financial conflicts of interest or biased reporting, it can misguide a physician's management of a patient. In order to deter this possibility, studies must be performed to ensure that the clinical practice guidelines are conducted with sound methodological quality and in an ethical manner. It is important that researchers incorporate standardized methods to report their findings via the use of reporting guidelines, such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and CONSORT (Consolidated Standards of Reporting Trials). Researchers must also use core outcome sets to ensure that different studies' findings can be compared with one another.

The studies that I have conducted have highlighted discrepancies in the quality of research found in articles published in critically acclaimed journals. Although my clinical interests lie in the field of emergency medicine, my research has found its way into specialties such as hematology, critical care, orthopedics, dermatology, cardiology, and anesthesiology, as well as emergency medicine. I have conducted research in these fields because I believe that for my line of research to make an impact, it must prompt change in the way research is conducted across all disciplines.

As my career progresses from being a student to becoming an attending, I plan to grow my skill set as a researcher. I believe that my research experience as a medical student has given me a greater understanding of how to critically interpret studies' findings. In the end, this will improve the standard of care that I can provide my patients. Moving forward, I plan to continue to perform systematic reviews and quantitative analyses, but I also hope to broaden my research experiences. Upon entering residency, I plan to conduct clinical trials and observational studies examining the morbidity and mortality of patients from rural settings in Oklahoma who have critical conditions. I believe that my current knowledge of systematic reviews will guide me in performing a methodologically sound primary study that will later assist in the development of clinical practice guidelines to improve patient care.

OWAIS DURRANI



Ever since I knew I wanted to practice medicine, I saw myself as a physician who would take the time to treat each patient as a fellow human being. I was and always will be committed to treating patients rather than a list of symptoms. Over the last few years of medical school, I have learned that equally important as caring for our patients is caring for each other. It is no secret that the road to becoming a physician is a tough one, with countless personal and professional challenges. As students at Oklahoma State University Center for Health Sciences College of Osteopathic Medicine

(OSU-COM), we are blessed with a culture in which we truly support our peers—we engage and empower each other.

During my second year at OSU-COM, I had the privilege of serving as the vice president of the Student Government Association (SGA). Part of my responsibility was to represent our school at national conferences of the AACOM Council of Osteopathic Student Government Presidents (COSGP). That year, COSGP, as a group, decided to tackle head-on the stigma surrounding mental health in our profession. We surveyed students nationwide to learn how they felt campuses treated the issue, we initiated conversations with local and national osteopathic leaders, and we held events on campuses throughout the year to shine a light on this topic.

One such event was our Osteopathic Medical Student (OMS) Day of Wellness. The goal of this day was to come together as a campus and recognize that some of the challenges we don't talk about in the open are not unique to only us. We had Dr. Pete's Pet Posse (pet therapy), professional masseuses, coloring books, a wall of encouragement (with Post-it notes with positive thoughts), and a lunch with discussions about mental wellness. During lunch, we had an activity in which we provided thank-you cards, envelopes, and stamps to the students, asking them to write thank-you notes to people who helped them get to medical school.

Over the next few weeks, students approached me and other members of our SGA team to express how glad they were about the open discussions we had about wellness. Our peers described the peace of mind they received from knowing we were all on this journey to becoming physicians together, experiencing many of the same challenges. I remember one student telling me how writing a thank-you note to his parents allowed him to realize he had a strong network of support in his family that he could always reach out to. Furthermore, he stated that our OMS Day of Wellness allowed him to think about the big picture and how he was living his dream every day. When I organized the

OMS Day of Wellness, I had thought of it as a break for our students in the middle of a hectic semester, but it turned out to be so much more. Thinking back on it, I realize that I engaged my peers and helped them reflect on themselves and their networks of support. I reminded them of the resources they had in family, friends, school, and within themselves to be the best they could be.

My time in student government and in organizing events like the OMS Day of Wellness has impacted me more than I ever thought it could. The past years have allowed me to broaden the way I think, and my key takeaway has been that we have to empower each other through engaging our peers. Engaging each other doesn't have to be an organized day or a big event. It could simply be asking a peer how he or she is doing or offering some help. Essentially, we have to be cognizant of the men and women we learn and work next to. I am now prouder than ever to be a part of the osteopathic medical profession, a profession that has at its core the value of family, whether it be at the level of the American Osteopathic Association (AOA) or the level of our campus. That sense of belonging to something bigger than one's self makes getting through the tough times easier. Furthermore, the empowerment of our peers and profession allows us to be better physicians who can better engage our patients.

I look forward to practicing medicine by having my patients be part of their own health care decisions. Through the deliberative model of medicine, I hope to enable my patients to improve their health and life outcomes by practicing the type of medicine I envisioned when I first decided to pursue my career.

DEREK HILL



When I was a young boy, just a fledgling, I was certain I wanted to be a Ninja Turtle. The thought of fighting bad guys and eating pizza was a sufficient estimate of a life of worth. Truth is, I never truly out-grew ostentatious and fanciful dreams. At various times, I “knew” I would be a professional musician, an athlete, or—even for a short time when I ingenuously considered myself a literary fanatic—an English professor. A life in medicine never appeared on my radar. Becoming a physician, studying the art of healing, on no occasion seemed befitting of me—not until

my own experience as a patient reformed my perception of my life’s calling.

After a year of college, I realized I had little interest engaging in any of the aforementioned professions; the university I attended, surprisingly, had no ninja pizza-eating courses. In 2006, I enlisted in the United States Army as an infantryman. A little more than one year later, I was in Iraq. I can still remember, as if I have just walked out of a movie about the experience, the feeling of sand in my boots, the scent of the air, and the weight of my body armor bearing on my shoulders like a knife. During my time in Iraq, I was exposed to casualties, which also seemed like part of a motion picture. In one incident, I sustained a traumatic brain injury from a buried road-side bomb that stuck the truck I was driving.

A few years later, I was living in Washington, DC, still having recurring issues from my injury. Headaches would engulf me. When these migraines would settle in, I started noticing alarming symptoms. Eventually, I’d lose my speech and my ability to comprehend language. It was happening so often I ended up going through neurological and occupational rehabilitation at Walter Reed Army Medical Center. During my treatment, I was captivated by the interaction between physicians and their patients. I was amazed by the depth in which the doctors knew their science and medicine. However, the intangibles inspired me the most, especially the interfacing and solidarity that revealed a benevolence I had never been exposed to. My recovery became the cornerstone of my channel into patient care, into medical school.

Over the next six years, my fervidness intensified as I left the Army, re-entered college, and sought out more health care experiences. After six years, three cross-county moves, a bachelor’s degree in biology, and a master’s degree in anatomical sciences, I finally found myself in medical school. I became a student doctor. Retrospectively, the path to where I am today still baffles me. The perfect amalgamation of opportunity, an inquisitiveness for science, my mulish disinclination to quit, and the compelling nature of

Derek Hill

taking care of people in their times of need blended into a formula that has afforded me the great privilege to be studying osteopathic medicine.

All of us in medical school have stories of how we ultimately came to pursue doctoring. It is sometimes enthusing and sometimes comical to consider why a person would desire this path. There are countless hours studying, and decades of training and honing not only the knowledge but also the physical dexterity required to perform tasks most individuals would deem repugnant. We strive to be great, even perfect. We sacrifice time with our loved ones so we can do right for other people whom we don't know. We all have our differences, but we also share one common goal, and this, I believe, makes medicine great. By each bringing something different to the table, we together offer diverse qualities that ultimately benefit our patients through the delivery of our care. There is no one mold from which a doctor is born. At some point in time, amidst the marsh and mire of life, there shines a clarity that transcends the ideas of dedicating your life to anything else. For me, it is doctoring. And now, to my son who is nearly five, I tell him, "Yeah buddy, you'd make a terrific Ninja Turtle!"

NEILMEGH VARADA



“I’ve had patients come in on hundreds of meds worth of opiates, and after working with them, I have gotten them off all of their narcotics. But what I need is a way to document these data, proving that a multidisciplinary method works,” explained my principal investigator, Dr. Steven Dechter, when we first discussed the prospects of conducting a study on controlling a patient’s pain with a decreased reliance on opiates. Although it has been known for many years that opiates cause addiction and death in patients, the data and methodology for getting patients weaned off opiates have been sparse. My

goal was to demonstrate this in a study.

Research was one of the many reasons I wanted to go into a career in medicine. Growing up in Richland, Washington, a town known for having the highest concentration of PhDs in the world, research was something I was always exposed to. I have longed to further medicine not just with patient care, but by helping to develop methods, modalities, and medications that will improve patient outcomes around the world. From first competing in the Intel International Science Fair, to publishing data on neutropenia seen with ceftaroline therapy, to my current project on decreasing patient usage of opiates, I see research as the manifestation of my passion for medicine.

My present research on controlling patients’ pain while tapering them off opiates is perhaps my most exciting endeavor. The control of pain may be the most widely seen issue in medicine. Every physician will deal with it, and just about every physician will see a patient who has abused or is abusing pain medications. Prior to medical school, while working for the Department of Veterans Affairs, I was astonished by the size and scale of the problem of narcotic abuse and addiction. Based on my own clinical experience, patients often came to their provider—whether it is a psychiatrist, pain medicine specialist, or family medicine doctor—armed with bags of opiates. Some patients want to get off the drugs, and others attempt to get more. My research in decreasing pain medication usage with proper medication management has examined the efficacy of invasive methods, such as spinal cord stimulators and injections, and the use of chiropractic and physical therapy. Results so far have demonstrated a substantial decrease in the usage of opiates with the incorporation of these management methods. Our study is one of the largest on this subject, compared with those currently in the literature, and we hope to get it published in early 2018. Although not a “magic bullet” in the fight against opioids, I hope this study can provide some insight into how to combat the opioid epidemic.

Neilmegh Varada

I see medical school as a time for exploration, to gain a deeper understanding of all fields of medicine, and I have tried to accomplish this through research. I hope to become an internal-medicine physician specializing in infectious disease or hematology and oncology. My research projects are derived from these interests. Yet, to be the best physician I can, I must have a deeper understanding of all areas of medicine. I see case reports as a way of accomplishing this. I have published several such reports, and am in the process of publishing more. These case reports further my own studies in pathology, while alerting my colleagues around the world to interesting cases that my own preceptors and I have seen. Multivalve endocarditis, for example, is an extremely rare diagnosis. In a previously published 30-year case review, only 54 patients had been reported with this diagnosis. But I was fortunate enough to see such a case during one of my rotations. A teacher once told me, “The patient walks into the room telling you what disease they have, and it is our job to guess it.” However, our guesses are only as good as evidence-based medicine demonstrates. This is where I come in: alerting other physicians to my findings in hopes that they may better help their own patients.

Sir Isaac Newton once said that he discovered the truths of science by “standing on the shoulders of giants.” My work in research is by no means as substantial as that of Newton, but it follows this principle. I hope to be involved in research my entire life and to work in an academic practice, not only caring for my own patients but continuing my work on studying disease through both basic science and translational research. I am “up to the challenge” of doing something no one else has done before in order to help as many patients as I can, fulfilling my own variant of doing no harm.

STEVEN ENGBRETSSEN



I believe in vision and hard work. Theodore Roosevelt implied the power of this combination when he said, “The credit belongs to those who are actually in the arena, who strive valiantly, who know the great enthusiasms, the great devotions ... who at the best, know the triumph of high achievement and who, at the worst, if they fail, fail while daring greatly.” If a vision of an idea can be built in our own minds, it will often bring out the participants’ best traits and abilities to realize that vision. This principle reverberates in my mind more often than I can measure. In fact, this ideal has led me to great suc-

cess in working with the underserved populations of Yakima, Washington. One of the more successful and impactful of my efforts includes the campaign for increased oral and systemic health in the region.

I had the privilege of participating in a public health project focused on the improvement of oral and overall health (termed “oral-systemic health”) beginning with my first semester at my medical school. At that time, the idea was simple—reverse the trend of the increasing disease burden of childhood cavities in Yakima, including on the Yakama Nation tribal reservation. However, this simple idea was met early with numerous barriers, including time restraints, misunderstandings, and logistical and political challenges. It seemed prudent to rely on the foundational philosophy of my profession and move forward with a holistic approach. I remember driving past homes in Yakima while thinking about the families in each home. I wondered how we could improve their lives, especially their children’s health. I wondered how we could turn the barriers we faced into strengths. At the same time my empathy was growing for this group, a plan was developing among other students, our faculty mentor, and myself.

Over time, small successes led to unexpected enthusiasm, including the production of bilingual community education materials, basic research presentations, and a TEDx Yakima spotlight. Ultimately, the stage was set for a bigger step forward, which became the first-ever oral-systemic health conference to be organized and promoted by a medical school—the Pacific Northwest University of Health Sciences College of Osteopathic Medicine (PNWU-COM). I was fortunate to lead the conference brainstorming, planning, and arrangement for this multidisciplinary event. I was able to recruit intelligent, passionate, and capable PNWU-COM students and administrators, each of whom had distinct responsibilities matched to their skills. After about a year of planning, we held this paramount and successful event.

Steven Engebretsen

This service afforded me the opportunity to demonstrate leadership and professionalism in addressing the needs of our own underserved population. Discussions with physicians, academic administrators, health-profession students, and numerous health care workers formed the backbone of our success. Our goal was accomplished. We successfully brought community members together, and real discussion began to address the public health crisis. Additionally, the oral-systemic concept caught fire with many PNWU-COM students. I am privileged to remain in an advisory capacity to these students as I continue my medical education outside the region. I plan to continue the dialogue with the many interprofessional partners to make the practice of health care and the improvement of individual health more seamless.

I am fortunate to have had many opportunities to work hard for my vision of better health for all. Although the life and career of a senior medical student and resident is sometimes nomadic, the same principles of vision and hard work that have made me successful in academics and extracurricular activities will continue to serve me as I serve others. I think this realization is the real personal and professional reward of being fully engaged in a project for good. This is what will benefit me the most as I move forward to treat patients and reach out to the community in my future career. I would add just one more thing to my beliefs that were inspired by President Roosevelt—excellent peers. The project outlined in this essay—as is true with any great endeavor—brought incredible people together, and we were able to accomplish something greater than the sum of our parts. Thus, it is more correct for me to say, I believe in vision, hard work, and teamwork.

ANDREW CANAKIS



As Albert Einstein once said, “Education is not the learning of facts, but the training of the mind to think.” These wise words highlight the fundamental notion of how research provides students with the building blocks to investigate clinical problems and transform the problems into practical solutions. During my time in medical school, I made research a priority in my education as a way to train my mind to think creatively. Guiding the evolution of an idea from the bench to the bedside is a rigorous challenge, and a unique skill to acquire.

For me, this long, rewarding research journey began in college when I worked in a microbiology lab for three years investigating how *Helicobacter pylori* maintains tight control of gene expression in the stomach’s hostile environment. Learning bench skills and how to work in a team setting in this lab taught me early on that research is an all-embodying process underlined by teamwork. Similar to the energy and excitement I felt the first time I caught a big wave surfing, I was instantly hooked on the intellectual challenges that research provided me—the chase of an idea, the unpredictable nature of the data, and the feeling of successfully completing a project.

During medical school, I was actively involved in a multitude of projects, including case reports, retrospective studies, and even the co-authoring of a book chapter with my mentor at The Johns Hopkins Hospital. I was captivated by the concept of looking at a problem and trying to understand it through the scientific principles of testing a hypothesis. Additionally, working in a team setting on many of these projects taught me the importance of communication, dedication, and reliability. Furthermore, I honed my skills as a presenter at conferences and abstract competitions. For me, research instilled not only confidence in my abilities but a never-ending quest for more.

All of these experiences have provided me with a strong foundation to expand my capabilities as an internal medicine resident next year, when I plan to conduct many quality-improvement projects along the path toward fellowship. It is my goal to become a gastroenterologist with a focus on inflammatory bowel disease. As an osteopathic physician, I plan on being a leader in the field and expanding the realm of treatment modalities by following the tenets of osteopathic medicine. By understanding the patient’s disease within a broader context, I hope to research and develop nonpharmaceutical options for patients, such as specific carbohydrate diets, supplements like curcumin, and mind-body therapies like acupuncture and yoga. The words of Einstein will resonant with me every

Andrew Canakis

step of the way as I continue to train not only my own mind but also my future students. Mentoring and educating the next generation of osteopathic researchers will be a number-one priority for me.

THIS ESSAY HAS BEEN REMOVED AT
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AUTHOR'S REQUEST



EMILY J. ESHLEMAN



The beginning of my first year of medical school was very difficult for me. I felt completely overwhelmed, lost, and unsure in my ability to succeed, or even to pass my first trimester of classes. I grew closer with my classmates and found that I was not alone in feeling this way, and that most students I spoke with had similar feelings. We got through that first trimester together and have continued to reach each medical-school milestone along the way by supporting each other. Our school offers many resources for students—some specifically for the transition to medical school during

the first year. However, I felt like something was missing that would have made this transition easier and would have given us the confidence that we needed to succeed from the beginning. I heard about other medical schools' physician mentorship programs. These physician mentors are able to provide wisdom, career guidance, and support for students throughout their medical education. This type of program would have made an immeasurable, positive difference in my transition to medical school, so I decided to try to start an osteopathic physician mentorship program at Philadelphia College of Osteopathic Medicine (PCOM).

After winter break of first year, I sent out an interest survey poll to my classmates. The results showed a large interest in physician mentors, so I met with PCOM's Curriculum Committee chair to get his feedback. I then wrote a proposal and presented it to the Curriculum Committee in February 2016; the committee voted in favor of supporting the program. In April 2016, we met with the dean, who gave us his support and allowed us to include the mentorship program in the faculty's appointment letters, making it an official part of each faculty DO's responsibilities. Throughout the summer between first and second year, I worked with two dedicated faculty DO coordinators and one of my classmates to establish the program logistics, write a manual, and compile resources for mentors. We launched the program in August 2016 and enrolled the entire first-year class (about 270 students) and half of the second-year class, along with more than 30 osteopathic physician mentors. Throughout my second year, we sent out feedback surveys each term, held term quality-assurance meetings with the mentors, and made incremental changes to the program. By September 2017, more than 400 first- and second-year students participated in the program with more than 30 mentors, and there was a new student chair leading the program with a committee of students.

Our mentorship program is in its infancy, but there have already been some positive outcomes. Students commented that they feel supported, "knowing that there is

Emily J Eshleman

someone to talk to who knows what they've been through" and can provide the "perspective of being on the other side." There have also been instances of faculty mentors identifying students in mental health crises and getting them help and the necessary resources before it was too late. There are incredible, compassionate, and dedicated faculty physicians at PCOM; this program only facilitated bringing them together with students earlier and in a more formalized way.

I was fully engaged and dedicated many hours each week to this program. I am passionate about it and the importance of mentorship, so I never felt tired or burnt out. And I am proud of my PCOM community. The strength, resilience, and personal stories of what brought my PCOM peers to osteopathic medicine inspire and motivate me every day. I do not want future PCOM students to ever feel as overwhelmed, lost, unsure, or alone as my classmates and I felt during our first few months of school.

This experience has taught me that dedicating time to things that I am passionate about will not lead to burnout. The way I spend my work hours matter more than the number of hours I work. I intend to carry this lesson with me as a future physician by incorporating my other passions into my career, such as teaching, mentoring younger physicians and students, and working with the community to prevent injury and illness on a population level. I also recognize that none of this would be possible without my dedicated classmates and our faculty champions. Thus, I learned that as a future osteopathic physician, I will always need a supportive team to accomplish any meaningful change and to make any lasting, positive impact.

DANIELLE M. WARD



Leadership and mentorship have allowed me to stay fully engaged throughout my medical school career while impacting my school, community, and the osteopathic profession. From starting as a non-traditional student who struggled for years just to gain acceptance into medical school to becoming the first osteopathic medical student to ever serve as president the Student National Medical Association (SNMA), it has been extremely important for me to encourage and inspire those around me to push for and pursue their passions in life. My goal is to show that as long as an indi-

vidual exhibits dedication, persistence, and a little patience, then any goal can be accomplished, and I use myself as an example of this each and every day.

The most important resources for impacting and empowering others throughout my medical school journey have been my personal blog and my leadership involvement with various organizations. Originally created when I could not find minority physicians with similar experiences as myself, my blog has not only allowed me to highlight minority women in medicine, but it also serves as personal recollection of my journey to becoming a physician. The main goal of my blog is to let my readers know that if I can accomplish my dreams of becoming a physician while being a single mother, staying engaged with my community, and overcoming many obstacles along the way, then they can accomplish their goals as well. I receive messages from my readers on an almost daily basis letting me know that my blog has inspired them to continue with their own dreams, and this lets me know that I am helping to make an impact on those around me. It also makes a huge positive impact on my life when I receive messages from individuals letting me know about their accomplishments, which they might not have achieved had they not stumbled upon my blog. It is truly awesome to be able to connect with complete strangers and help them succeed, and it is an impact that I want to continue to make for the rest of my life.

Leadership involvement has allowed me to have direct influences on my community, including premedical and medical students. During my second year of medical school, I was able to serve nationally as chairperson of the SNMA. This experience gave me the opportunity to discover the needs of osteopathic medical students across the nation and to directly address some of these needs through the SNMA. I currently serve as national president with the same organization, where I have developed programming through my executive agenda that involves my passions for cultural competency, developing future leaders, and making sure that young children and premedical students can realize their full potentials in life. It is an amazing experience knowing that thousands of students

Danielle M. Ward

across the country are actively working to carry out my vision and engaging in community service centered around my agenda. I hope this will make an impact for years to come. However, having my own child watch me take on the reins as president for the organization, while being surrounded by thousands of physicians and medical students who look like her, has held the biggest significance in my medical journey thus far.

As a future osteopathic physician, my experiences have influenced the way I plan to practice medicine. I have had the opportunity to interact with individuals from various backgrounds while being able to share my own experiences in order to form deeper connections. As a physician, it will be important to me to make sure that I am providing the best care possible to my patients, and this would not be possible without being culturally competent and aware of the social issues affecting today's society. I want to be able to empathize with my patients and center my care around each individual's unique needs, and my past and current experiences greatly help with this. My goal as an osteopathic physician will be to continue to make a positive impact on those around me while dedicating my life to medicine, and I cannot wait for the opportunity to take my experiences further as a physician.

NATALIE POLIEKTOV



Advancing age is associated with a decline in physiological function that increases the risk of clinical disease and disability. The number of older adults in the United States is expected to double by the year 2050, resulting in a new epidemic of age-related disability and associated health care costs. Cardiovascular diseases (CVD) remain the number-one cause of death in the United States, and advancing age is the primary risk factor for the development of CVD. Arterial dysfunction, secondary to oxidative stress, occurs with advancing age and is the key antecedent to the development of

CVD in older adults. Thus, interventions that reduce arterial dysfunction in older adults hold promise for improving physiological function and reducing the age-associated risk of CVD.

During my time in the Integrative Physiology of Aging laboratory at the University of Colorado-Boulder, I demonstrated that by boosting the ubiquitous signaling molecule nicotinamide adenine dinucleotide (NAD⁺) in vivo, we could reverse arterial dysfunction and prevent the onset of CVD in old mice. Young and old mice were given the NAD⁺-boosting supplement nicotinamide mononucleotide (NMN) for eight weeks in their drinking water. We then assessed arterial function and markers of oxidative stress in the mice. The NMN completely restored vascular function in the old mice to the levels of young mice, and this change was associated with a reduction in arterial oxidative stress. My research uniquely contributed to the field of aging research, as this was the first study to show a reversal in arterial dysfunction with NMN. We published our results in the journal *Aging Cell*. Because our results were so promising, we then translated these findings into a small clinical trial with older adults, who were given a similar NAD⁺-boosting compound in the hope that this supplement could delay or prevent the onset of age-associated CVD in humans.

As I carried out my research, I began to understand the impact that the aging population will have on our society, as well as the complexities of human disease. By dedicating my time to studying mechanisms of physiological dysfunction and using a holistic approach to assess health, I felt like I was doing my part to move this important field of medicine forward. I've developed a deep appreciation for basic and translational research and their implications for clinical investigations. Upon completion of my master's degree, I sought out new experiences to enhance my development in biomedical research. I worked as a clinical research coordinator at the University of Colorado Hospital, where I assisted a team of interventional radiologists conducting large clinical trials on vascular

health. This role gave me insight into applying scientific discoveries directly to patient populations.

The skills that I've acquired over the last seven years will help me to pursue research as an osteopathic physician. I plan to practice medicine at an academic hospital, where I can work in an interdisciplinary team of physicians and scientists to make novel discoveries and move the field of medicine forward. My research background has provided me with the unique ability to conduct basic science experiments and translate the findings to carry out clinical trials. Most importantly, I enjoy all aspects of research, from the initial spark of an idea to publishing the results in the literature. I hope to either have a complimentary laboratory to my practice or to join a team of investigators so that I can dedicate my time and expertise to discovering new ways to promote health in my patients. I plan to be highly involved in research by writing National Institutes of Health-sponsored grant applications, enrolling patients in investigational studies, and conducting basic science research to further understand the mechanisms behind my clinical outcomes.

During my educational career, it has become apparent to me that providing quality health care and developing innovative ways to prevent and treat disease require creativity, flexibility, and attention to detail. My research background has sparked a curiosity and interest in holistic and preventative medicine, which I would like to pursue as an osteopathic physician. I want to be a physician who promotes health and wellness, forming a lasting partnership with my patients to not only treat disease but to prevent it. I will dedicate my career to treating my patients as whole beings and provide them with access to comprehensive care, including all available treatment options, any experimental interventions to which I have access, and guidance on lifestyle modifications, to allow their bodies to obtain homeostasis and foster their own health.

PENELOPE ANNE HERDER



My fascination with the sciences and medicine began when I was a child. My father is a physicist, and he would always explain natural phenomena to me in more depth than “that’s just the way it is.” He would ask me questions as to what I thought was going on, helping to develop my natural curiosity. My father had sustained several episodes of ocular insult, necessitating multiple operations. We would visit his ophthalmologist several times a year, and I insisted on asking the physician questions. This doctor would teach me about my father’s conditions, and I found myself

intrigued with medicine and wanted to learn more.

In college, this curiosity regarding understanding the world intensified, and I pursued degrees in the sciences. I especially enjoyed the labs and thought I might like working in a research laboratory. My employment in the laboratory started as a naïve opportunity to try something new and pursue my interests. I had no idea that I would fall in love with this scientific process and that this new venture would become essential criteria for me in a future career. While in the laboratory, I performed bench work and animal studies to help the team fill in our gaps of knowledge about the pathophysiology of nicotine addiction. My experiments consumed me, but I wanted to learn more from a clinical standpoint and to interact with those whom our research served. This desire led me to medical school.

When considering medical schools, I looked for a well-rounded education and gravitated toward the osteopathic philosophy and tenets. With the osteopathic approach, I would be exposed to various modalities to treat patients and have numerous tools at my disposal. And I would gain more tools to help educate my patients. But while in school, I missed going to the lab and doing experiments. There were few opportunities for bench work at my institution, so I made the decision to pursue other avenues of the profession. The opportunity to serve both the osteopathic and military communities presented itself, and I approached this challenge with uncertainty. I had been a bench researcher, performing such tasks as inserting DNA into cells, operating on animals, and performing assays. What did I know about orbital trauma and its test design? It turned out to be very little, but what appealed to me was the challenge of formulating my own experiment from scratch.

Our research project compares a novel trainer to the “gold standard” in training medical-personnel in vision-saving procedures, lateral canthotomy and cantholysis. Given my lack of familiarity with this field, I dived into the literature and learned as much as I

Penelope Anne Herder

could to become an expert on our study topic. I discovered that there is a great need to know these procedures in my respective communities. This is because modern warfare has changed. Insurgents are more creative in designing weapons of terror, and the incidence of head and neck traumas (preceptors to conditions necessitating our trained procedures) has increased. Additionally, maximizing training in these procedures is lacking. This is where our research is unique: we questioned if training could be capitalized and improved to help preserve vision.

I am thankful for the preceptors I have, because they afforded me with multiple opportunities. I can't believe how much I have grown from my bench-lab days. During that time, I was told what experiments needed to be completed, and what direction the project was heading. With my new challenge, I had minimal supervision, and I didn't feel like I knew the topic well enough to even get it off the ground, let alone design an experiment. But this is where my mentors pushed me to demand more from myself. From these lessons, I am confident that active, hands-on research will be an integral part of my future as an osteopathic physician. I have learned invaluable tools for all aspects of research, from writing an Institutional Review Board proposal to writing a manuscript for journal publication. My interest in a topic and my desire to contribute to our knowledge of a subject are what drive me. I could not have accomplished this without the help of my mentors along the way, and I am forever appreciative. I look forward to the day when I can be a mentor to those students pursuing an osteopathic degree who share the same passion for research as I do.

PATRICK WALLACE



While validating research is important, it is just as important to develop new methods and research ideas. Research is a daily part of the medical field. Everything known, practiced, and taught through textbooks and lectures saturates the minds of future physicians. This material has been repetitively studied by researchers before us, and it guides our decision making and helps us develop our clinical gestalt.

My intended specialty is emergency medicine. It is a raw, demanding field for physicians, requiring a robust knowledge in many areas of medicine. We are pantologists, capable of handling anything that comes through the doors. We must be lifelong learners and remain involved with research. I have embraced multiple research projects, each more unique than the last. This has allowed me to branch out, tackle several areas of medicine, and strengthen my diversity of knowledge.

My team and I are currently conducting a clinical trial in which I wrote the Institutional Review Board material and study design, registered the trial with the federal database, and assisted in the protocol design. This trial involves ultrasound-guided injections of platelet-rich plasma (PRP) into the sacroiliac joint. The PRP is extracted from the patient's own blood and re-injected into the affected joint. Once injected, PRP releases various growth factors, which facilitate joint regeneration. Our trial also utilizes the newest ultrasound techniques in joint injections, an area that is growing rapidly and quickly becoming a standard of care in emergency medicine. Only one other study exists on this topic, from India, and its applicability is limited by a small population size of 25 injections. Our trial has the goal of 100 participants, and will measure the effectiveness of the injection for up to one year post injection. The findings will serve to establish the efficacy of PRP joint injections in the sacroiliac joint. Our clinical goal is to bring PRP to the front lines of regenerative medicine, making it as commonly used as corticosteroid injections.

This trial will help revolutionize the way back pain is treated. Many providers still believe the best treatment for joint pain or low back pain consists of opioids, and their prescriptions contribute to our ongoing opioid epidemic. Currently, all the other therapeutic options, such as nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, and physical therapy, treat only the pain and not the underlying disorder. Platelet-rich-plasma would be the first option to treat the underlying disorder and alleviate joint pain.

I have contributed in multiple other studies related to emergency medicine, the most unique of which involves the human-worn partial task surgical simulator ("cut suit"). This

40-pound suit is worn by a trained actor covered in moulage. The suit has the feel of skin, it bleeds, and it smells of bowel when perforated. It is the most realistic simulator to date. During a one-week training course, medical students, first responders, and military medics are put through rigorous simulations that place them under immense amounts of stress while responding to patients wearing the cut suit. Participants are forced to quickly perform a primary survey and intervene on patients while exposed to sirens, improvised explosive devices, and active shooters. Interventions may include cricothyroidotomy, emergency-department (ED) thoracotomy, needle decompression, and suturing. Participants have their cortisol and amylase levels measured throughout the simulation to study stress habituation. Additionally, participants are evaluated for the effect of this course in altering their motivation away from grades and scores and transitioning them to a focus of patient-oriented care. This research is paramount in changing the future of simulation medicine, especially for procedures crucial to a patient's survival, but this type of training is rarely seen in the emergency department. We hope to be certified through the Accreditation Council for Continuing Medical Education so that the course can be offered for CME credit and integrated into every student's curriculum.

My goal is to continue incorporating research in residency. I plan to continue my simulation technology research throughout residency and expand the cut-suit simulation to more medical schools. Additionally, I have hopes of starting my own clinical trial after residency to discover a clinical decision rule for appendicitis and other abdominal etiologies that often require a computed tomography (CT) scan to rule them out. A scoring criteria like this would help minimize CT scans for patients, decrease costs and time in the ED, maximize comfort, eliminate unnecessary procedures, and increase patient satisfaction. Osteopathy means caring for my patients and keeping their best interests in mind. I hope to continue my involvement in various research projects to optimize patient care and broaden my scope of understanding, providing an exemplary model of an outstanding and well-versed osteopathic physician.

JOSEPH LAPORTA



I watched in horror as his body was propelled off the roof of the car before it landed on the street and began convulsing violently. Seconds before this, my mind had been focused on a million other things: the concert I had just left, the conversations my friends were having in the backseat, my upcoming pediatric shelf exam, my weekend plans, my dog who was sick, my fantasy football team lineup... all these thoughts had been racing through my head. That changed the moment I witnessed a hit-and-run and saw a complete stranger have a grand mal seizure on the side of the road. Instinct

took over, and the two-plus years of medical training I had instantly kicked in. Before I knew it, I had pulled my car over, and my brother and I were running to help the man. All of the thoughts that had previously clouded my mind evaporated as I became fully engaged in the present. With the help of my brother and a few other Good Samaritans, we stabilized him until emergency medical services could arrive.

Beginning with that night, early in my third year of medical school, I learned just how important it is to compartmentalize one's thoughts as a physician. It is easy to become lost in daydream. At any given moment, the mind is barraged with thousands of ideas, memories, and emotions that can commandeer your attention away from the task at hand. After all, we live in a society that promotes excessive stimuli and perpetuates distraction. From advertisements to "click bait" media, there seems to be increasing emphasis on diverting the mind from the present. While a distracted mind can be a normal phenomenon and often is completely benign, it becomes dangerous when the life or well-being of another human depends of your focus.

Having the knowledge and ability to save a person's life is a special privilege. However, as the old adage goes, "With great power comes great responsibility." Throughout my third and fourth years, there have been many days when I wanted to stay distracted within my head. Days when the burdens of school, sick family members, strained relationships, and other stressors weighed heavily on me. Days when the last thing I wanted to do was attend to my daily work. After all, medicine is amazing, but it does not come without its own stress. From my experience that night with the hit-and-run, I've learned to catalog within my mind. This has allowed me to respond to a code blue or diagnose a complicated neurologic disease without distraction. Afterward, only at a more appropriate time, I can return to my personal thoughts.

I truly believe that this ability to become fully engaged in the current task will serve me well as a future osteopathic physician. By focusing on the task at hand and then,

Joseph LaPorta

only later, processing my thoughts through exercise, meditation, and journaling, I've been able to give my all to patients without sacrificing my own well-being. I know that as I progress through residency and beyond, this will not change. Physicians will always face personal hardship, and they will always have distracting thoughts and emotions overwhelming them. Yet, they will also always have patients who rely on their focus. I am grateful to have learned this cerebral balancing act early in my career, and I am confident that this ability to fully engage with the present will serve me well in the years to come.

NEIL JAIN



My desire to pursue research is multifaceted. Many life events have precipitated my interest and involvement in and my passion for the field of research and scientific development. Frustrated by the loss of my grandmother due to cancer in 2007, I could not grasp the harsh reality of this deadly illness that takes the lives of millions of people. After realizing that my anger was not going to bring back my grandmother, I learned to channel this negative energy into a more productive and rewarding form. As a curious and brazen high-school student, I became involved with a

study revolving around a potential pharmacological treatment for melanoma. This project allowed me to realize that research is both dynamic and technical. However, I was not aware that this opportunity was simultaneously providing me with the foundation for research that was essential for my future involvement in scientific discovery. Ironical as it may sound, my love for research stemmed from one of the most heartbreaking events in my life.

I wanted to expand my involvement in research, which began with my grandmother's passing, into studies that focused on improving the well-being and health of my culture as a whole. In college, I was exposed to the psychological aspects of medicine. My academic studies investigated psychiatric illnesses and substance abuse in various cultures. I implemented what I learned in the classroom into a more practical setting by studying the therapies for cocaine addiction used at McLean Hospital in Belmont, MA. However small my contribution was to the larger issue at hand, I was working toward destigmatizing mental illness in the Indian culture. This experience confirmed my desire to pursue a career that is centered on improving both the physical and mental health of individuals.

As an osteopathic medical student, I understand the importance of humanism and patient-centered care. While I am currently involved in several clinical projects at different institutions, they all serve the same goal: improving patient outcomes. My research at the Pediatric Thyroid Center and the Interventional Radiology Department, both at Children's Hospital of Philadelphia, is focused on developing national guidelines for staging diseases that are unique to the pediatric population. Whereas current thyroid research in the adult population is well-developed, there is a lack of statistical evidence in studies primarily on children. It is my goal to contribute to the field of medicine by conducting research on entire patient populations. Furthermore, my projects at the Care Institute of Medical Sciences in India uniquely serve to improve standard care and provide guidelines in managing cardiac patients in an underdeveloped country.

Neil Jain

I look forward to continue to serve both locally and globally. As an advocate for life-long learning in medicine, I plan on always incorporating evidence-based medicine into my daily practice. I am a strong believer that research moves medicine. Since populations and diseases will continue to evolve, there will always be a need for medical advances. As a future osteopathic physician, I plan on being at the forefront of scientific discovery.

ALEXANDRA LESENSKYJ



My introduction to the research community involved setting out longlines in open water to tag sharks and lowering baited remote underwater video systems into the sea to record the sharks' behaviors. While learning about the research process as a high-school student and part of the team at the Cape Eleuthera Institute in the Bahamas, I came to understand how seemingly simple findings can have broad implications. Sharks have a nuanced immune system with capabilities that the human immune system lacks, making them valuable research subjects for fighting

viruses and modulating tumorigenesis. Following sharks in the Bahamian waters opened my mind to the notion that complex problems are best approached with a willingness to understand many perspectives.

With this outlook, I sought to pursue a career through which I could use creativity to solve problems while also influencing people in a positive way. Interacting with my cousin Colin, who has autism, sparked a question that inspired my senior research fellowship at Middlebury College. The inclination to feel distress for someone else occurs at many levels and over a broad spectrum. For Colin, reacting to someone else's pain is not a natural response. By contrast, there is evidence that experienced meditators display high levels of mindfulness and compassionate motivation. By examining the hormonal changes that occur in people who regularly meditate, my research specifically addressed a potential physiological mechanism associated with feeling compassion.

An interest in neurobiological mechanisms as they apply to clinical settings brought me to Capital Institute for Neurosciences. As part of the team there, I had the opportunity to work on several projects, helping bring together a diverse interprofessional group of specialists. The hospital's specialized neurological emergency department (NeuroED), led by an osteopathic physician, made for an interesting setting in which to examine optimal patient care. In a pair of projects, retrospective and prospective, I evaluated patient management post-transient ischemic attack (TIA). Given appropriate work-up and diligent follow-up, we found that patients who are discharged from the hospital post-TIA have lower stroke recurrence rates than those who are admitted into the hospital after the attack. Also through the NeuroED, I developed a project regarding prehospital stroke alerts (PHSA). Members of our local emergency medical services (EMS) team were trained to recognize and rate strokes in the field via the Cincinnati Stroke Scale, and then alert the NeuroED prior to arrival. Aiming to provide stroke patients with faster access to care, we found that the use of PHSA overwhelmingly improved times to delivery of care,

Alexandra Lesenskyj

compared with the non-use of PHSA. Equally as important, the EMS providers showed marked improvement in their ability to accurately recognize stroke.

These projects with the NeuroED uniquely contributed to the current body of literature by highlighting the importance of interprofessional cooperation. Concurrently, I led several other projects, regarding chronic neuropathic pain management. My team included neurologists, nurses, and social workers specializing in the administration of rigorous neurostimulative therapy regimens—specifically, repetitive transcranial magnetic stimulation and scrambler therapy. Additional projects with this team addressed different ways to predict risk of opioid abuse in individuals with chronic pain. Direct feedback from the group of patients with whom we worked highlighted the positive impact that alternative solutions can have in confronting difficult medical conditions. The comprehensive nature of therapy provided in this setting underscores the value in considering the whole patient, rather than solely individual symptoms.

A successful physician must do more than find sickness in a patient. A successful physician must identify what makes a patient feel better. In the spirit of A.T. Still's philosophy, a successful physician finds health. An osteopathic approach requires understanding the whole patient, seeing medical problems from many angles, and considering unique solutions catered to an individual's needs – a philosophy I will carry through to my future work. Under the guidance of an osteopathic specialist in movement disorders at Drexel Neurosciences Institute, my most recent meta-analysis merges these values. Patients with Parkinson disease often experience concomitant medication-resistant depression, which complicates effective management and patient well-being. Using my knowledge of neurostimulation as it applies to pain and depression, I studied the use of a neurostimulation device within a Parkinson population. In that study, a creative approach and integration of multiple subspecialties served to provide an effective solution to substantial patient concerns.

In the future, I plan to pursue research that reflects these same values: resourcefulness, interspecialty collaboration, and comprehensive treatment. As a forthcoming osteopathic physician, I will consider my patients in their entirety, consistently thinking outside of the box to provide detail-oriented care. As an osteopathic physician-scientist, I aim to apply inventiveness in my efforts to solve medical challenges on a larger scale, while considering all aspects of patient well-being.

ASHLEY SAM



“**T**his is so stupid. Why do we have to learn this?”
“Science is such a waste! When am I ever going to use this anyway?”

These statements, and countless others like them, were regular comments that I heard from young students when I first started volunteering with Project REACH in Camden, New Jersey. The program was designed as an after-school elective for middle-school students in an underserved community to encourage their interests in STEM (science, technology, engineering, and mathematics) fields and healthy living. As a first-year medical student, I was beyond excited to share my passion for science with these young people. But my surprise at their apathy was overwhelming. I didn’t understand how a group of youth with so much promise and potential could be so negative. In reality, what I didn’t understand was the students themselves. After a few weeks of volunteering, it became clear to me that the only way to have an impact on these students was to work with them in small groups, preferably one on one. I started routinely speaking with the students individually, and I learned what I considered to be shocking information. It turned out the students didn’t dislike science at all. They just didn’t see the point in investing in the idea of becoming a scientist, engineer, or doctor, only to eventually find college or graduate school to be unaffordable for them. They had watched so many other students from their community dream big and fall short due to a lack of resources, and they refused to fall victim to the same scenarios.

These conversations with the students motivated me to continue my work beyond the two hours we spent in the classroom. My bright, motivated students were missing countless opportunities simply due to the lack of financial resources. The next time I visited, I asked the students what they would do if the sky was the limit. Some wanted to be doctors, some lawyers, one a Broadway actress... And then we got to work.

I spent a great deal of time throughout the rest of that school year looking for scholarship programs for local private high schools. I specifically looked for programs that would mentor students through high school and then guarantee them access to college scholarships. I also looked for charter schools that would nurture the needs of these students once they left middle school. By the end of that year, three of my oldest students had been accepted into pipeline programs for Rutgers University. Another student went to a charter school for the performing arts. Some of the younger students are still making plans for the future. Regardless of how the students choose to move forward from Project

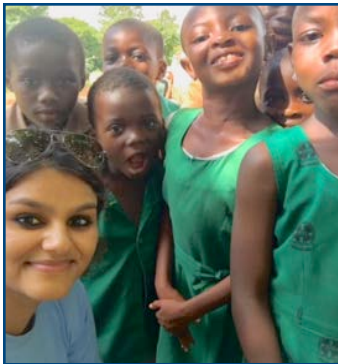
Ashley Sam

REACH, every one of them transitioned from finding our time together as “stupid” to thinking of it as “fun,” “exciting,” and, in some cases, “life-changing.”

My time in Project REACH prepared me for a much larger challenge that I now face nearly every day working with patients. So many patients have barriers to health care that we cannot see. Many patients live in areas where their only food source is a bodega. Others may be single parents of multiple children and can’t find time to come in for a routine health maintenance examination. Some have been struggling to find affordable health insurance but can’t even afford the most inexpensive of medications for their chronic health conditions. Despite all of these barriers, the medical establishment often views these patients as “noncompliant,” rather than as people who are struggling, because health care workers often don’t ask the questions to learn this information. My students at Project REACH taught me to look past the limitations of what the eye can see and to really engage my patients to understand them.

As part of my visits in the family-medicine office and the emergency room, I always ask patients if they have any concerns about their ability to complete their health care plan. As a future pediatrician, I plan to consistently ask parents if they ever worry about putting food on the table, or if they fear about being able to provide adequate care for their child or family. I will strive to always provide access to resources for families who may be struggling, so that their visit to the doctor can be one less stressor in their life. Most importantly, I vow to be a physician who never writes a patient off because he or she projects a tough exterior. Rather, I will always seek to engage and understand in order to provide the best individualized patient care possible.

PALAK PATEL



It was Tuesday, June 6, 2017, at about 8:00 PM. “Young lady, you have two pulmonary embolisms—one large clot occluding your right pulmonary artery, affecting the right side of your heart, and another clot in your left lung. If you had waited any longer, you probably would have died.”

I remember hearing those words in the emergency room and thinking it was a dream. Surrounded by ominous lighting and cries of people in pain, it felt surreal. I had a heart rate of over 140 beats per minute and I could barely breathe as I listened to doctor after doctor shuffle

into my room. I felt lost and numb when no one would directly answer my question, “Am I going to be okay?” Test after test, no one would tell me my results, until now, when I finally found out why I was in excruciating pain. As a medical student, I had always thought of the ER as a place where I was excited to shadow and learn from doctors about medical cases. But today I was the patient, and I had never felt this weak and defenseless.

I had just returned from a two-week medical mission trip to Ghana. This rewarding trip was a labor of love and hard work that I planned through a club at med school. I love international medicine and wanted to make it a part of my medical school education after traveling to Central America during college for a service trip. I traveled to Ghana with 22 other students in my class, and we endured a lot of traveling to get back from the rural areas in Ghana where we were staying. We spent two weeks with members of Blue-Med Africa setting up mobile health clinics in villages to help provide health care to people who had previously not been able to receive it. Then upon my return to the United States, I found myself confronting my own serious health problems.

I spent most of this past summer recovering from my treatment, and thanks to the love and care I received from my family and boyfriend, I got better. It took me a month to be able to walk on my own again, because I was so weak. It took over three months for the pain in my chest to dissipate. Even today, I still have trouble breathing, but I made it to the second year of medical school. It’s been a hard year. I think my biggest lesson from this was to not let it sour my outlook on life. I kept thinking all summer, “Why me? People go on long trips all the time and nothing happens. I went on this trip to try to help others, and this is what happens to me?”

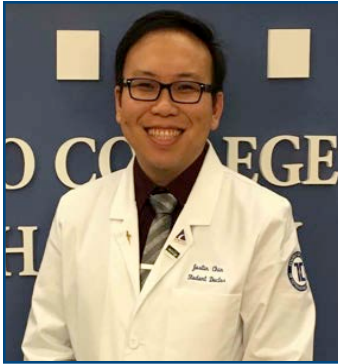
I know now that going through a health challenge like this taught me more than I would have ever thought it could. I learned what it’s like to be a patient who is scared, sick, and vulnerable. I literally stepped into the patient’s shoes and spent a week, in the intensive care unit and on the in-patient floor, learning what it is like to be on the other

Palak Patel

side. I truly gained insight into what empathy is. Through all of this, based on the care I received, I discovered exactly the type of doctor I want to be and need to be. I didn't discover my specialty, but I realized that no matter what I choose, I want to be a genuinely kind, empathetic, and considerate physician. I will strive to be a doctor who listens to her patients and provides an environment of support and care.

Up until this health scare, I had never had a brush with death. Ever since it happened, so many people have said to me, "This probably makes you want to live life to the fullest" or "Life's too short, so make sure you follow your dreams." But the main thing that almost dying taught me was this: I am on the exact path that I have always wanted to be on—the path to become a physician.

JUSTIN CHIN



“The body is capable of self-regulation, self-healing, and health maintenance,” according to the tenets of osteopathic medicine. As I stared at the cadaver in anatomy lab, this tenet kept running through my head. With that in mind, I zeroed in on the liver as my topic of research, looking specifically at morphologic variations among the different specimens. The liver is the largest viscera in the abdominal cavity and is one of the few organs in the body that can undergo large-scale regeneration after injury. Biological and genetic mechanisms of regeneration under patho-

logical situations have been elucidated at great length, particularly under the Couinaud classification. By contrast, benign morphologic variations of the liver have not received comparable attention. With increasing dependence on radiological imaging for diagnosis and laparoscopic procedures, knowledge of common anatomical surface variations of the liver is crucial for the best patient outcomes.

Upon their initial discovery, hepatic morphologic variations have received negligible coverage in allopathic and osteopathic research due to their typically benign nature. For example, Riedel’s lobe was named in 1888, and since then, minimal studies have delved further into its pathogenesis and clinical implications. Within the literature, there is a wide distribution in prevalence of these variations in both living and cadaveric specimens, which complicates attempts to associate hepatic variations with clinical symptoms. Case studies have documented hepatic morphological variations in the mimicry of hepatic pathologies, such as repositories for hepatocellular carcinoma/malignancies. These studies, however, have presented their findings as singular, chance occurrences, which can be due to the lack of longitudinal research in the pathogenesis of nonquiescent hepatic morphologic variations. Although my own study was unable to correlate hepatic morphologic variations to clinical symptoms or pathologies, it showcased the prevalence of common variations and it consolidated previous research on potential pathologies relating to these variations. Future studies are needed to better associate surface morphological variants of the liver to its functionality and clinical presentations.

I have greatly valued the opportunity to educate others about the osteopathic medical profession. My research was presented at the Asian Pacific American Medical Student Association’s Hepatitis Conference (in conjunction with the American Association for the Study of Liver Diseases), as well as at the regional conference for the American Association of Anatomists. In both conferences, this was the only research that was presented by an osteopathic medical school, as the hosting organizations were both

Justin Chin

predominantly allopathic. After my presentation, questions invariably would run along the lines of: “What is osteopathic medicine?” “What is a DO?” “Are you a chiropractor?” Each one of these interactions was born out of genuine interest but lack of knowledge about the profession. Explaining the tenets of osteopathic medicine and its clinical applications, I witnessed firsthand how osteopathic outreach is crucial in connecting with both medical professionals and the general population. In a sense, I was able to serve as an ambassador to my field, which is a truly powerful experience.

As a future osteopathic physician, I will use my passion for research and teaching to interact with communities without previous exposure to osteopathic medicine. In doing so, I hope to construct an environment in which individuals could better understand the importance of improving wellness by preventing diseases and promoting health. Furthermore, I will continue my research to inspire the next generation of osteopathic physicians to think critically about the world around them.

NICHOLAS FARON



When we begin to talk about pediatric refractive surgery within the United States, there is one surgeon in this country who began this procedure years before others started evaluating its benefits. Our studies of pediatric refractive surgery are among the earliest and largest in the world. I have been first author on the majority of these papers. I brought many of my ideas to Dr. Tychsen after observing various trends within the database I built while working with him at St. Louis Children's Hospital.

The impact that our research has had on the ophthalmology community is profound, changing the way many pediatric ophthalmologists think of refractive surgery in children. Our research suggests that pediatric refractive surgery can be efficacious and immensely beneficial for millions of families around the world. Most of the parents that come to Dr. Tychsen had been to several other pediatric ophthalmologists who told them that their child's poor vision is a consequence of a neurological disorder (e.g., autism, Down syndrome, cerebral palsy). These children are already socially at a disadvantage because of their neurologic disorder. With the addition of poor vision (as poor as 20/3500), these kids are forced to live their childhoods in a cocoon of blur.

In a study we conducted with a questionnaire, parents of noncompliant children were willing to trade off 12 percent of remaining life years (e.g., 10.3 years of life for an 8-year-old), and accept a 17-percent risk of blindness caused by surgery to correct the ametropia. Comparable values of two percent and one percent, respectively, were found in compliant children. This finding alone shows how much these parents were willing to give up just to have the opportunity for their child to be able to see the world as everyone else. Similar to osteopathy's alternative-medicine principles, Dr. Tychsen offers these parents an alternative type of medicine that no one else is able to offer to improve the quality of life of his patients.

Although there has not been a great deal of osteopathic research in the field of ophthalmology, a recent study by Dr. Mark Sandhouse in *JAOA—The Journal of the American Osteopathic Association* examined the effect of cranial manipulative medicine on visual function. Dr. Sandhouse found there was improvement in visual function after the manipulation was completed. Dr. Tychsen is always looking for new therapies and ways to improve his patients' quality of life. We have begun to set up a project evaluating cranial manipulation post-refractive surgery to look for additional benefit to the patient. This research has the potential to empower osteopathic medicine by providing

Nicholas Faron

new pediatric evidence that cranial manipulation improves visual function and, thereby, quality of life.

The most important outcome of our research has been improving the quality of life of patients. This improvement is reflected in the following testimony of parents whose children had the refractive surgery procedure: -

“Able to finally start to skate & play hockey.”

“Very pleased, now able to play piano, guitar & volleyball.”

“Improved confidence, able to walk more on his own.”

“Very pleased, tremendous visual improvement, SAW STARS & MOON FOR FIRST TIME.”

“Reading better than ever; reads print, no longer braille.”

“Use to trip, now much better; improved vision – now knows letters & numbers.”

“Paying more attention to environment; A WHOLE NEW WORLD FOR HIM.”

It is clear that our research is not just about improving the vision of these children, but also about improving their quality of life. We are one of the only facilities in the United States that offers these procedures. This research offers an outstanding opportunity to change the lives of thousands to millions of families as this revolutionizing procedure will change the lives of countless children across the world. I have dedicated more than five-and-a-half years of my life to this research because of these principles, and I will continue to dedicate more and more of my time each year.

SARAH ALY



Growing up in New York City meant being exposed to a plethora of cultures, languages, and foods. I ate seaweed snacks before gym class, the occasional samosa at lunch, and drank bubble tea before playing outside with my neighbors. Trying different foods was an integral part of learning about other cultures for me. As my palate grew, so did my exposure to other cultures.

It is for this reason that when I became president of the International Medicine Student Organization, I wanted my first event to revolve around food to celebrate the diversity of the Touro community. We called it “Tastes of the World.” The event took on another dimension when the “Mother of All Protests” was held on April 19, 2017, in Venezuela. In the course of that protest, many casualties were reported. Thus, students and faculty were invited to bring in food from their cultures to raise funds to help provide medical supplies for hospitals in Venezuela. Food from all over the world filled tables, and flags from over 100 different countries hung around the cafeteria. The Touro community broke bread with one another, sampling the flavors of India, Egypt, Burma, Venezuela, and many other countries we otherwise may not have had the chance to experience and appreciate.

However, “Tastes of the World” provided more than I expected. At the close of the event, a Venezuelan classmate voiced her appreciation. She was touched that we came together for the people of her country, as well as by our acknowledgement of Venezuela’s current crisis. This moment emphasized to me the impact that this kind of acknowledgment can have on individuals. To further develop cultural awareness and sensitivity, there needs to be an emphasis on keeping up with current events in the larger global community, as opposed to focusing only on the communities with which we personally identify. Seeing everyone come together in the cafeteria was striking and served as a reminder for me that we live in a diverse society encompassing a wide range of heritages, religions, and races. I knew this before attending medical school—so I always made it a point to share my Muslim and Egyptian identity with my classmates. I shared stuffed grape leaves and stories about my family with them, hoping that this would eventually translate into culturally sensitive care toward their future Arab or Muslim patients.

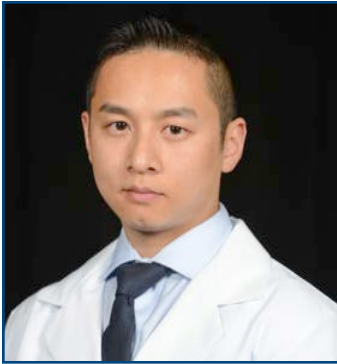
What about the care I am to provide my future patients who do not identify as Arab or Muslim? Practicing medicine in our diverse society means paying attention to more than just my own background. Hearing from my classmate how much “Tastes of the World” meant to her, I understand that instead of simply sharing my own culture with

others, I must also allow others to share theirs with me. By actively seeking out information relevant to my peers and their cultural identities, I can better become the physician that my patients deserve.

Often in our bubbles here in the United States, and even more so in the bubble that is medical school, it is easy to be oblivious to current events that influence the people and the world around us. Nevertheless, it is imperative that we seek information about other communities so that we may give our patients the acknowledgment that allows for the nurturing of a meaningful relationship with them. I hope that in my practice, I can care for all my patients in a way that respects their beliefs, ideals, and needs. The physician-patient relationship is a sacred partnership built on trust. The best way to build trust in our diverse patient population is to show a vested interest in their respective cultures. Cultivating this deep relationship with my patients will no doubt result in better long-term health outcomes for them. At the same time, it will allow me to develop into the best possible physician that I can be.

As future physicians, we should aim to keep an open mind to the diversity that we will encounter throughout our careers. We can't let dates like April 19, 2017, go unnoticed, while elsewhere they become dates that are ingrained into the memories of people hoping for the betterment of their country. We must allow our patients to believe that they are seen and heard—and this starts by recognizing our shared humanity, as well as the nuances that come with our differences.

JOHNNY TRUONG



With the exception of some family heirlooms sewn into his lining, all he could bring was the clothing on his back. Orchestrated by his father, a small fishing boat was paid off to deliver him from Vietnam to Thailand. The family heirlooms were necessary for bribing other individuals: government officials, other fisherman, or pirates. The most efficient and most secure route was via boat. It's a dire situation when the choppy ocean passageways prove to be safer than the land you call home. The journey proved to be physically exhausting. There was little food or water, humans were

packed like objects, and each day only fed their doubt that they would ever make it ashore. Vietcong raids and pirate attacks were common among refugee boats, and the physical exhaustion of the refugees was paralleled by their mental strife.

Rumors had begun to spread: thousands of people dying of starvation, individuals robbed of their only possessions by fisherman, and bodies ruthlessly discarded overboard. When the ship's engine broke down, the group was stranded indefinitely. Aimlessly adrift in the South China Sea, it was almost a week later until a Thai fishing boat passed by. With what remained of the passengers' bribes, the crew were allowed to come aboard. Eventually they arrived in Thailand, where the next three months were spent in a refugee camp. A charity organization orchestrated his passage to Canada.

Shortly after his arrival in Canada, he sent for his wife. Several years later, I was born. It is pure luck that my father is alive, pure luck that he made it to Canada, and pure luck that I was born in much better circumstances. The circumstances of my family's history have shaped my outlook on the world and on what I can offer the world. The main reason I chose Touro College of Osteopathic Medicine–New York (TouroCOM-NY) as my medical school was the school's mission statement: to serve the underserved. One of my first opportunities at Touro was to volunteer with HONOR. I was first introduced to this organization through Family Medicine's Health Van event. I was able to continue helping HONOR through the biweekly health screenings. Blood-pressure screenings and general health questions were the standard when we began in August. Since then, we have been able to expand our screenings to performing osteopathic manual medicine (OMM) and vision screenings.

At first, I was concerned that I would not be able to provide much help, as I was only a second-year medical student. However, one of my most recent encounters with a patient reminded me that I can provide, even with what little I know. Mr. A. came in with a history of osteoarthritis in his hip, substantial pain with transferring and weight bearing,

Johnny Truong

and significant range-of-motion restrictions. I carefully performed the muscle energy technique to his hip and thigh, the Spencer technique, articulatory techniques to his hip, and myofascial techniques to his lumbar spine. After all these techniques, Mr. A reported feeling significantly better than he had in months. It was clear to myself and those around me that he was much more limber and could move with more ease.

This story of osteopathic manipulation serves as a reminder that we can make important changes with what we already know and have—even if we don't know or have much, such as this second-year medical student. I have seen my family rise up from nothing. Their story will always remind me to rise to any challenge, knowing that I have so many privileges that I can use to benefit others. One day, I will have much more knowledge and ability to help those in need, but I don't have to wait until then to help provide for our communities.

The year 2007 was the first time I visited Vietnam. This experience helped me realize the opportunities my father has given me and how privileged I truly am. With that in mind, I try to take advantage of every opportunity to serve those in need, such as low-income families, people of color, and immigrants who wander on to our shores. These beliefs led me to pursue a degree in medicine. It will be my life's work to make sure that no choppy ocean passageways will be thought of as safer than a person's homeland.

MALLORY MITCHELL



The summer after my first year of medical school, I had an incredible opportunity to work and learn at the Shirati District Hospital in the Mara district of Tanzania. Throughout this experience, I fell in love with the local community and the patients under my care. I was able to leave them with a small gift, which was teaching the local staff and students a protocol for neonatal care that aims to save infants who are born struggling to breathe. The Helping Babies Breathe protocol was developed by the American Academy of Pediatrics in response to the World Health

Organization's goal to reduce neonatal mortality in low-resource settings. Research has been conducted that shows incredibly promising results that the Helping Babies Breathe protocol can reduce neonatal mortality when it is properly implemented—but only when it is properly implemented.

While teaching this protocol to the local birth attendants in Shirati, it became increasingly clear that they did not have access to even the most basic resources that the protocol requires, including warm baby blankets and bag-valve masks to provide life-saving respiration. This lack of resources was unimaginable and very frustrating to me. How were infants dying due to a lack of such basic resources that are so easily accessible in the United States? While I knew that the lack of resources was a systemic issue, I felt personally driven to become fully engaged in this cause and take immediate action. After returning from Tanzania, I developed a philanthropy organization called Shirati Babies Project, which is a nonprofit that aims to provide the necessary resources for proper neonatal resuscitation to the maternity ward at Shirati District Hospital. I created a website, where people were invited to donate \$10 to sponsor one baby blanket for the maternity ward. The blankets were made with local materials by dressmakers in the Shirati community, giving much needed employment to Tanzanian women. Each blanket cost \$3 to \$4 to make, and the rest of the \$10 was used to purchase respiratory supplies.

I was amazed by the outpouring of generosity from people across the country. I was able to deliver more than 300 baby blankets and 40 stethoscopes, as well as bag-valve masks, a fetal heart monitor, and many other respiratory supplies to the hospital during my last trip there. I have continued to work on this project with the hopes of empowering health care workers at this hospital to properly implement neonatal resuscitation—and, ultimately, to save the lives of more infants. I know this experience will have a substantial effect on the way I practice medicine throughout my career. I learned that I never have to wait for systemic health care issues to be solved by top government leaders, because I

Mallory Mitchell

have the power to positively affect the system by keeping my eyes open, caring deeply for others, and being willing to put in the hours and sweat to come up with creative solutions to complex problems. This experience required me to remain completely engaged and focused on a cause over an extended period of time. It required some early mornings, late nights, many hours, and a great deal of resiliency and determination.

After seeing the positive impact of my efforts in the maternity ward in Shirati, I do not see the suffering of patients as something that is out of my hands or that cannot improve in the absence of a perfect health care system. I see their health, happiness, and suffering as things that I care deeply about, and I have been given the honor and responsibility to improve their circumstances. As osteopathic physicians, we are called to see the patient, not the symptom; to promote health instead of just the absence of disease; and to reach out for solutions instead of staying comfortable in routine. We are not doctors who say, “That’s not my job.” We are doctors who make the health of our patients our life’s work and pursue that above all else no matter what, even when it seems impossible—especially when it seems impossible.

I wasn’t able to provide a baby blanket to every infant in this low-resource hospital, but I was able to provide a blanket to 300 of them, and that is so much better than zero. Not being able to do everything is not an excuse to do nothing. More than anything, that is what I will remember from this experience that required so much of my engagement and effort. We are doctors who DO, not doctors who wait. I will continue to be this type of doctor throughout my career, because I strongly believe these are the types of doctors who make a lasting impact, even if it is one mask, one blanket, or one patient at a time.

BERSABEL WOLDEMARIAM



As a person who grew up in Eritrea, I had neither the opportunity nor the understanding to successfully conduct a research project. My first real experience with research was the master of health science (MHS) research component, from the initial steps of Institutional Review Board (IRB) approval to my first one-hour podium presentation at an AACOM conference and my publication in *Science Educator Journal*. In the MHS program, successful students are offered the opportunity to matriculate either in the osteopathic medical school or in the physician assistant school once

they earn the required grade point average (GPA) and, should they opt for medical school, Medical College Admission Test (MCAT) score. However, Touro University Nevada College of Osteopathic Medicine (TUNCOM) formerly had very strict MCAT-score requirements, even for those who outperformed the osteopathic medical students with whom they shared courses and took identical summative exams. Students who earned very high GPAs in the master program were not admitted to medical school because of their low MCAT scores, while those who had satisfactory MCAT scores were accepted even if they did not perform as well in the master program. Some of these students struggled through the four years or were dismissed from TUNCOM.

During the fall semester of the MHS program, I elected to work with Dr. Amina Sadik, who was conducting a research project to assess whether the cumulative MHS GPA is a better predictor of success in medical school than the MCAT score, or vice versa. I thought it was an important issue that demanded an immediate solution. Consequently, I decided to join the project under the supervision and mentorship of Dr. Sadik. The statistical analysis of the data collected retrospectively for five cohorts revealed that there was a strong correlation between cumulative MHS GPA and student success in both preclinical years and Comprehensive Osteopathic Medical Licensing Examination of the United States (COMLEX-USA) levels 1 and 2. However, there was no statistically significant correlation between students' performances in medical school and their MCAT scores. Since the publication of these results, the administration at TUNCOM has made adjustments to the medical school admission requirements of students graduating from the MHS program. The College of Osteopathic Medicine now gives significant weight to the GPA earned at the end of the MHS program, as opposed to the MCAT score. This is a breakthrough for the program, as there were numerous competent students rejected from the medical school based on their MCAT scores alone, regardless of their performance in the master program.

Bersabel Woldemariam

Witnessing the progressive evolution of the MHS program, particularly due to the contribution of my findings, has made me realize how powerful well-conducted research can be when it is backed by well-founded literature and statistical analysis. I feel extremely lucky to have been part of this project and proud of its outcomes and their positive consequences, as I am aware that it has already begun to shape the way that the school evaluates applicants. The new admission criteria are now fully implemented and will be used to determine who among the MHS students will be given the opportunity to matriculate in the medical school. I believe that this contribution will allow many future MHS students to attend medical school—students who less than a year ago might have been rejected despite having performed extremely well in the master program. Through this project, I learned research design and methodology, from completing the numerous pages of the IRB application and writing justifications, and I became familiar with data collection and statistical analysis. I am able to critically analyze literature and select works that form a solid background for my subject of interest, prepare a manuscript, and select the proper journal in which to disseminate my findings. These skills will allow me to undertake other research projects, such as how to increase the representation of minority students in osteopathic medical schools, during and beyond my clinical training years.

NEIL CORBETT



I started my undergraduate career at Boise State University unsure of what exactly it was I wanted to accomplish with my life. I had the inkling that I wanted to do something important, something that would benefit others and something that might leave a lasting impression, but it was just a feeling I had. Nearly 15 years later, I have found the focus of that feeling, one that I am actively pursuing now in my second year of medical school. As a requirement of my master's degree at Touro University Nevada College of Osteopathic Medicine (TUNCOM), my classmates and I were

matched with basic science faculty to complete a research project. I had the honor and privilege to match with Dr. Mahboob Qureshi, who has guided and encouraged me since the first day I met him.

I've spent much of my research time working with mouse pups and observing the effects of respiratory syncytial virus on the lung environments. While it may be difficult to draw parallels between furry, little white mice and larger, mostly bald human babies, my research has helped me appreciate the significant physiological changes and stress that infants (and adults) experience when infected with pathogens. Correlating the physical signs with analysis of the transcriptional regulation that is altered on a molecular level adds an entirely new facet to the understanding of a disease process. Such understanding goes beyond the clinical picture that we study in the literature. It also adds an additional layer of validation to all that is written in the textbooks of medicine. When I first began working in the emergency department as a scribe, I wasn't sure what it meant to be a physician, let alone an osteopathic physician. In my mind, physicians were extremely smart and intelligent individuals who knew just the right dose of medication or just the right area to incise in order to save a patient's life.

It wasn't until I began my research at TUNCOM that I saw physicians as what they truly are—scientists on the front line. I believe that even though we have a good understanding of a great many disease processes and normal physiological processes, there is an ocean of knowledge we have yet to consider. My work in primary research has granted me a sense of accomplishment and dedication to the study of medicine that I otherwise would not have developed if I had not been matched with my mentor. Assuming that all goes relatively according to plan, I would like to consider a career either in pulmonary/critical care or in cardiology. My hope is to continue the research that I have started throughout this journey, focusing on achieving a full understanding of the adaptations and changes that our bodies go through in response to the onslaught of exposure to

Neil Corbett

pathogens. I consider myself exceptionally lucky in that I also have the tools of osteopathic manipulative medicine. I look forward to the opportunity to incorporate manipulation into the assessment and treatment of disease conditions.

I have realized that medicine is built on the seemingly endless years of research that has been painstakingly performed by scientists. My research experience has impacted my medical school education by placing me in an active role in the advancement of science and medicine. Rather than passively consuming knowledge and information, I actively seek out additional sources and form my own questions to ask with the hope of learning at least one new thing every day (something I tell my daughter frequently). My goals are to continue the projects that I have begun until all my questions have been answered, at which point it will be time to start asking a few new questions.

VANESSA HALVORSEN



My alarm goes off at 3:30 a.m. I get up and walk past my desk, shoved into a corner of my bedroom. I marvel at the huge stack of medical-related books that I have collected during my time in medical school. Beside them is a stack of articles covered in highlighter and notes, evidence of another late night. My white coat is hung neatly over the desk chair. I think about the day of surgery I have ahead and pray that my reading will be sufficient to answer any questions my attending might have. I recall the day before when he had yelled at me and thrown a hemostat against the wall.

I think about why he did that. I head to the bathroom to brush my teeth and look into the mirror. I don't recognize the girl that I see anymore. Where did her passion go? Why did she look so unhappy? Isn't this what I always wanted? To be in medical school? To be a doctor? To be a surgeon? Do I have what it takes? These were my daily questions that consumed me after my sister had taken her own life in February of that year.

I had already been acquainted with death when I lost my father at 11 years old. In fact, my father's death was the catalyst for me to enter into the medical world. My early career in medicine had been a unique and complex experience. I had taken almost three years to learn how to treat people in an effort to save little girls from what I had experienced at a young age. Yet, I wasn't able to help one of the most important girls in my life—my own sister. I was heartbroken trying to understand what had happened. On top of that, the daily onslaught of stresses that accompany medical school were more difficult to understand, contextualize, and integrate than ever before. Things that had motivated me before, like the high levels of technical and semantic knowledge, were overcrowded by the confrontations with the limits of human life. I became depressed and I no longer wanted to be a doctor.

I knew I wasn't the first person to experience this in medical school. In fact, I had been working with The American Osteopathic Association Mental Health Task Force to research our student body in hopes of combatting an epidemic of these psychological issues. However, I didn't know how to begin to help myself out of this consuming doubt and fear that now filled my mind. Luckily, I had great family and friends who were able to recognize what was happening to me, and with their encouragement I sought help. I reached out to a therapist who would help me over the next few months to identify why I held myself accountable for the passing of my sister.

Not only would this therapist teach me new coping skills, but she helped me employ a routine of daily positive mantras and vision boards to remember why I had chosen to

take the Hippocratic Oath three years prior. These are tactics that I still am employing now, almost a year later, as I go throughout the tedious process of audition rotations and interviews. I know that both the loss of my father and my sister will help me be a better physician. Not only do I feel that overcoming these challenges have given me the answer to my daily question of “Am I enough?”, but I know I will be better able to serve my patients as I can empathize with their losses, their worries, and their doubts. As a future doctor, I will be entrusted with some of my patient’s most vulnerable moments. I know that I will treat them with the same compassion that was shown to me during my trying times. I won’t throw a hemostat to prove a point to a future student, or walk away as I give a terminal diagnosis. Instead, I will try to impart some of the skills that I learned when I sought help, and I will hope that my words don’t meet closed ears. I believe that only through this approach can I potentially help someone who may be going through the same thing my sister was, and perhaps I can help the outcome be different. I now wake up at 3:30 in the morning revitalized because I have a mission. I still look tired, but not unhappy. My resilience reignited my passion.

SHARON GEERTS



Research has always been an integral part of my life and academic career. Inspired by my father's work in the field of neurodegenerative diseases, I originally started as a summer intern at the University of Pennsylvania in the Center for Neurodegenerative Disease Research, where I focused on characterizing a mouse model for Alzheimer disease and exploring the genetics involved in frontotemporal dementia and amyotrophic lateral sclerosis. At the University of Massachusetts, Amherst, my research was geared toward neuroendocrine science, studying neurotransmitter

innervations and stress hormone concentrations. It was during this time that I learned the key components of basic science research and how to plan and execute experiments effectively and efficiently while working in a collaborative research environment. These experiences taught me the importance of basic science and how to create and build upon the foundations necessary to accomplish great research.

After graduating from the University of Massachusetts, I wanted to pursue research prior to matriculating into medical school. Wishing to work full-time in a collaborative environment, I took a position at the Center for Engineering in Medicine (CEM) at the Massachusetts General Hospital (MGH), which is affiliated with Harvard Medical School. The main focus of the research at the CEM is to improve, and create alternatives to, liver transplants. According to the United Network of Organ Sharing, there are approximately 14,000 people waiting for a liver transplant and, unfortunately, many of these patients will expire prior to receiving a transplant. The impact of this growing organ shortage fueled my drive to explore the field of liver transplantation and bioengineering.

Under the guidance of Dr. Martin Yarmush and Dr. Basak Uygun, I worked on an independent project in which I studied the technique of decellularization of liver matrices in order to improve and increase the viability of decellularized liver grafts. This technique could make nontransplantable livers suitable for transplant via repopulating the liver matrix with healthy cells. I was able to use my skills from previous research to execute my project while learning many new skills, continuing to strengthen my abilities as a researcher. For example, I wrote my first manuscript, titled, "Non-Destructive Methods for Monitoring Cell Removal During Decellularization," which was published in *Tissue Methods*. This experience gave me the opportunity to develop my skills of critical thinking and data analysis, perform literary searches, and contribute to the field of tissue bioengineering. The unique aspects of my work and skillset at the CEM are helping to bridge the gap between basic science and clinical techniques.

Sharon Geerts

In the summer of 2017, I was granted the opportunity to work with Dr. Ann Rasmusson at the National Center for PTSD (post-traumatic stress disorder), Women's Health Sciences Division, within the VA Boston Healthcare System. I was invited to work on a project titled, "Contingency Management Supported Tobacco Cessation and Predictors of Relapse in Veterans with and without Posttraumatic Stress Disorder." Through this project, I learned how to work with clinical data and analyze complex relationships between multifactorial datasets. I also gained a tremendous amount of knowledge about the neurobiological aspect of PTSD, an ever-growing mental health problem with many comorbidities, such as depression and tobacco use. There is a significant relationship between PTSD and smoking rates, and individuals with PTSD have a harder time with smoking cessation and staying abstinent from tobacco. My work at the VA hospital allowed us to see interactions between neurobiological factors in patients with PTSD and their withdrawal symptoms when undergoing tobacco cessation therapy. These findings could potentially light the way for personalized therapy regimens with a focus on neurophysiological factors to improve the success rates of smoking cessation.

With my experiences in surgery at the CEM and my experiences in neuroscience, I wish to pursue a career in which I can incorporate both disciplines. I am inspired by the scientists and physicians I had the privilege of working with, and I will continue to take part in research throughout my own career as a physician. I want to seek out answers and develop novel approaches to techniques and treatments to improve the lives of my patients and also of people worldwide. Keeping in mind the osteopathic philosophy and disciplines taught in medical school, I am determined to apply the skills learned throughout my research experiences with my osteopathic background to lead scientific breakthroughs in the fields of surgery and neuroscience.

KATHERINE CONE



The osteopathic profession is one that I am so incredibly proud to be part of. Our tenets of osteopathic medicine state that 1) the person is a unit of body, mind, and spirit, 2) the body is capable of self-regulation and self-healing, and 3) our treatment is based upon the understanding of the interrelationship between structure and function. As a medical student at the University of New England College of Osteopathic Medicine (UNECOM), we are not only taught these tenets daily, but also the importance and significance of looking at each patient as a whole. We do not just focus

on one aspect of their health or lives, but rather combine each piece and take them all into consideration when compiling our differential diagnoses. My extensive work in Dr. Stevenson's laboratory has always taken a similar approach to each new question that is posed and challenge that arises. The Stevenson Laboratory is a drug development and drug discovery behavioral neuropharmacology laboratory that has mostly focused its efforts on the development of novel analgesics that could potentially replace the current ones that have extensive lists of deleterious side effects. While compounds like oxycodone, fentanyl, and morphine are regularly used to treat chronic pain, their overuse has undoubtedly contributed to the current opioid epidemic that our nation faces today. Testing Dr. Robin Polt's novel compounds like MMP-2200 and BBI-11008 reveal a promising future for the treatment of chronic pain.

One of the main reasons I was attracted to the osteopathic profession was for the training in osteopathic manipulative techniques to help my patients with their pain. When asked why osteopathic medicine vs. allopathic medicine, I always had my answer: "As a future physician wanting to help others, why wouldn't I want to be an osteopathic physician? We have an entirely additional skillset to use with our patients experiencing pain that allopathic physicians don't have." Some people confused my admiration for the profession with naivety, thinking that I did not believe in the use of prescription medications to manage pain. At this point, I would dive into a deep discussion of my research, explaining the daily characterization of abuse liability studies that I was performing on novel compounds and the dose-addition analysis studies I was conducting to determine better, more effective ways for scientists to discover new, more efficacious analgesics. My research has uniquely contributed to the osteopathic profession, because I am hopeful for a future where I can utilize my osteopathic manipulative skills in combination with safer analgesic therapeutics to treat chronic pain, thereby reducing the over-prescription of opioids and combating the opioid epidemic at the same time.

Katherine Cone

Osteoarthritis, a common disease associated with severe pain, was another focus of my studies in Dr. Stevenson's laboratory over the past six years. As a future osteopathic physician, I was interested in studying the protective effects of exercise on osteoarthritis, as I hope to focus a lot of my care on preventative medicine in the future. Our laboratory published a study with results that indicated that voluntary exercise may indeed protect against osteoarthritic pain. All of these studies mentioned above have been published, with the exception of the dose-addition analysis study which is currently in submission to the journal, *Psychopharmacology*. By publishing my research, I am further contributing to the discipline by allowing others to read about our findings and join us in the search for safer prescription analgesics and more preventative approaches.

As an osteopathic physician, I fully intend to attend the American Academy of Osteopathy (AAO) Convocation each year to learn about the new research breakthroughs, involvements, and studies being conducted in the field. However, I also plan to attend other conferences geared toward scientists, like Experimental Biology and Society for Neuroscience, so I can have an understanding of the new approaches in the basic science field as well. I will always be a medical student and osteopathic physician first, but I will keep my research skills and knowledge close in mind to always be open to changing the way I care for my patients. My network of scientists is exceptional due to the exceptional mentorship I received from Dr. Stevenson and the numerous connections he has made with others around the world. Although I will be a physician first, I will always be an eager scientist. I may not be in the laboratory performing the work myself, but I fully intend to stay engaged in the discussion and continue consulting with Dr. Stevenson on his continued studies.

CELESTE BOUCHARD



Since my junior year in college, I have been involved in a wide variety of research projects because I love the creative problem-solving and teamwork that research requires. The feeling of expanding the bounds of human knowledge has always provided me enough satisfaction to overcome the challenges that research often presents. Since I began doing research, I have been refining my specific interests. I have been primarily interested in biology and psychology, which led me to pursue a master's degree in medical science, focusing on the molecular basis of diabetes mellitus and, more

recently, on the effects of psychiatric drugs on metabolic disease at the molecular level. During the research for my master's degree, we discovered a protein that is deficient in diabetic mice. We then re-introduced this protein into mice using a viral vector, and we found that restoring the protein improved insulin sensitivity. In my research in medical school, we discovered that a widely prescribed atypical antipsychotic drug alters hepatic lipid and glucose metabolism.

These discoveries have been very exciting. But being educated in an osteopathic medical school for the past year and a half has allowed me to develop a deeper appreciation for the importance of considering all aspects of patients' lives when considering their health. This made me rethink the approach that I was taking as a researcher in addressing some of the country's most chronic and expensive diseases. Chronic disease, I learned, is the culmination of not only a patient's genetic makeup, but also a product of their lifestyle and socioeconomic status. This idea was reaffirmed for me at a seminar about lifestyle medicine that I attended at the Family Medicine Education Consortium in Cleveland, Ohio, this past fall. The clinician cited that 70 percent to 80 percent of an individual's health is dictated by lifestyle decisions. This made me think critically about how I can make the most impact as an aspiring primary health care provider. I realized that even if we found a way to increase the expression of the restorative protein we discovered in diabetic patients, this effect would be greatly reduced if patients were consciously or unconsciously making poor lifestyle choices, or if patients could not afford the healthy food they need to achieve better health.

At this point, I have realized that the intersection of my skills as a researcher and teacher and my passion for reducing the burden of chronic disease through lifestyle choices make me best suited to pursue primary care. Through conversations with current primary care physicians, I have learned that primary care is extremely flexible in that you can pursue your specific health care passion in your practice. I envision creating

Celeste Bouchard

a practical diet and exercise program for my patients that I can use my research skills to objectively evaluate. If successful, I would like to come up with a way to teach the program to other primary care physicians interested in lifestyle medicine. I envision this program as incorporating one small lifestyle change at a time for patients struggling with obesity and/or diabetes. Specifically, I would like to incorporate simple cooking workshops that involve basic nutrition education, exercise classes, social services, and mental health counselling services where appropriate. Furthermore, I would like to assess the effect of increasing nutrition education in medical schools. Through collaborating with classmates and our nutrition faculty members, we have already made some progress on this at the University of New England College of Osteopathic Medicine.

I hope to begin this new path of research during my third-year clerkship. I have recently finished the last round of interviews to pursue a longitudinal integrative clerkship for my third-year rotations at a site that brings food from a local farmer's market to a local youth shelter. I hope to start cooking classes at the youth shelter using the ingredients from the farmer's market, and evaluate if this has physical and/or mental-health benefits on the youth at the shelter. This longitudinal integrated clerkship allows me to be based at the same primary care clinic for the entire year, so I can make stronger relationships with patients and the community.

All of these programs that I strive to create are going to require objective evaluation and refinement to convince others that lifestyle medicine is a worthy pursuit. I believe that the skills I have gained with my research experience will help me immensely in my efforts. I am grateful to have experienced a diverse range of research opportunities, because it has allowed me to find where my true passion lies.

AMY E. CALLAHAN



Please note that the patient's name has been changed for confidentiality reasons.

Jack taught me the importance of communicating without words. I had the opportunity to get to know Jack over the course of eight weeks through my position as a neuroanatomy teaching assistant in the summer of 2017. He was a 54-year-old man who had suffered a massive left middle cerebral artery stroke in September 2016. According to the textbook, he should not be able to communicate through spoken language or

writing because of the fact that almost his entire left brain was destroyed by his stroke. However, Jack has preserved the ability to repeat words that are spoken to him and to copy words that are written in front of him. I was told by different medical professionals that Jack probably wouldn't progress much more in terms of his language and comprehension. That notion really bothered me. While part of me felt like this might be true, another part of me found it to be irrelevant. It seemed more important for Jack to feel like he is truly cared for and has ways to express his desires and needs.

When I first met Jack, he glanced at me with a blank stare beneath his golf hat and shrugged his shoulders, in what I later found to be the classic Jack gesture. I quickly realized that communication was going to be a challenge. How was I going to learn this patient's story and gather his history if we couldn't speak freely with each other and if he didn't even know who I was? After our first few encounters, I found myself holding back tears on my drives home from the rehab facility. One of my favorite parts about the physician-patient relationship is the ability to establish a rapport and truly connect. I felt discouraged, and I doubted my ability to bond with Jack and engage him.

I found myself constantly racking my brain for ways to communicate with someone who has a severe aphasia. I decided to turn to technology as my aid; I brought my iPad to each session with Jack. One day, I decided to attempt a game of tic-tac-toe. Initially, Jack simply copied whatever letter I had written down rather than alternating x's and o's. Then, in the middle of the game, he looked up at me and smirked, as if he suddenly realized what was happening. From that point forward, he played perfectly.

I also often wrote down words and had him copy them on the line below. I would then say the word and he would repeat it aloud. A few weeks into our time together, I wrote down my name as usual, and he copied it. I asked him who it was, and without hesitation or prompting, he replied, "Amy." I grinned and gave him a high five. I was thrilled,

Amy E. Callahan

and again he looked at me like I was crazy. In that moment, a glimmer of progress was clear to me. Jack knew who I was, and our relationship was solid.

I continued to explore ways to reach Jack. Some of my favorite moments with him revolved around music. He loves Lynyrd Skynyrd, so I decided to play some YouTube videos for him, including “Free Bird.” He began to sing a word, and I couldn’t help but imagine him sitting in his car on a beautiful day, blasting the tune. Again, Jack was present with me.

Jack has taught me one of the most important lessons of my medical school career: never give up on my patients. He reminded me that we are all vulnerable in various ways, and that it is my responsibility as a future physician to not fear this vulnerability. As I go forward, I know that I am going to encounter patients who are going to challenge me. I now know that these challenges can be overcome by being persistent, patient, and hopeful. Jack has taught me to be realistic but also to be open to exploring new ways to make progress. The most important part of my relationship with Jack was that we spent time just “being” together. This allowed me to get a sense for who he was and what he needed. He gave me the courage to step out of my comfort zone and dive into one of the most nuanced yet rewarding relationships I have ever experienced. These lessons have undoubtedly prepared me to be a better advocate for my future patients.

PARESH JAINI



During medical school, I developed a passion to utilize clinical practice, translational research, and community outreach to promote holistic health and disease prevention models at the individual and community levels. I have special research interests in preventive medicine (PM), lifestyle medicine (LM), and community health. The research I performed under Dr. Styliani Gouloupoulou's supervision focused on maternal cardiovascular dysfunction in preeclampsia, one of the leading causes of maternal deaths in the United States (1-2). In this work, I used animal models

to test the hypothesis that low-dose aspirin would have preventive effects on maternal cardiovascular dysfunction caused by activation of the innate immune system. To test our hypothesis and increase my research project's translational implications, I used a combination of molecular and whole animal physiology techniques. This translational research has significant implications in current medical practice, where physicians recommend low-dose aspirin as preventive therapy in women at risk of preeclampsia. Our results showed that low-dose aspirin did not prevent the development of hypertension in pregnant rats exposed to pharmacological activators of the innate immune system. This work demonstrates that a "one size fits all" prophylaxis for preeclampsia needs to be reexamined because its benefits may only be specific to certain populations or individuals.

I have also conducted research in the area of LM, an evidence-based approach to preventing and treating chronic disease through lifestyle interventions such as diet, exercise, and stress management. I have worked on various research projects with my professor Dr. Jenny Lee, including a publication regarding the need for further utility of the biopsychosocial model in medical school education (3), a preliminary study regarding curricular organization of a health promotion and disease prevention course at our institution, and a multi-institutional research study through the American College of Lifestyle Medicine (ACLM) studying health professions students' perceptions of LM. These research projects emphasize the need for future health care professionals to be trained in holistic approaches affecting health and patient wellness. In addition, with Dr. Lee's guidance, I am currently leading another study regarding the epigenetic effects of lifestyle interventions on depressive disorders, which was recognized this year as an "outstanding scientific abstract" at the ACLM conference (4). This work contributes to the field of LM because the effects of lifestyle interventions on depressive disorders have been minimally documented in scientific literature. Furthermore, applying epigenetic principles in LM is a novel approach that few experts, including Dr. Lee, have studied.

In line with my interest in LM, I collaborated with Dr. Janani Krishnaswami and submitted a manuscript proposing “community engaged LM” training in PM residency as a model for alleviating health disparities in medically-underserved communities (unpublished data, 2017). Community engagement and participatory research has not been utilized in the field of LM. Thus, our project proposes a novel training model that can potentially contribute to the way residency programs are currently designed to alleviate health disparities in communities. In addition to this manuscript, Dr. Krishnaswami and I will work on a literature review regarding community engagement and participatory research approaches to management of the lifestyle components of depression. This will be a novel approach to depression management that will be valuable for health care professionals in primary care and mental health.

Finally, this project underlines my strong interest in pursuing Psychiatry residency and PM fellowship and my goal to involve LM in my clinical practice. As an osteopathic medical student, I understand that “rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function.” My goal is to become a physician who incorporates evidence-based scientific approaches in clinical practice to promote health and prevent disease. In addition, I plan to work in an academic medical center where I will have opportunities to design educational curricula for undergraduate and graduate medical education and study trainees’ learning outcomes. I will sustain partnerships with the American Psychiatric Association (APA), American College of Preventive Medicine (ACPM), and ACLM to work on nationwide multi-institutional studies regarding the outcomes of community lifestyle interventions to prevent mental health disorders.

In conclusion, I aim to develop a career, in which I will utilize my research experiences and medical education in my clinical practice, research, and community outreach, with emphasis on PM and LM, with the goal to contribute to disease prevention and wellness at the individual patient and community levels.

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JAMES MEILING



I feel that I cannot completely express my full engagement to my community, osteopathic medicine, and school in just one event, because that would just be a snapshot. Instead, I will attempt to express my full engagement in the summation of moments that have enabled me to make a direct impact on my community, specifically the community of those with physical handicaps.

Before I begin, a little background information is important to set the stage. Even before delving into studies of the spine and spinal-cord anatomy in medical school, I was fascinated with the components of the back and neck. I attribute some of this interest to my father, who suffered a C2 vertebral fracture while I was a junior in college; furthermore, he had been diagnosed with multiple sclerosis when he was 25 years old. Miraculously, my father was not put into a wheelchair from his traumatic injury nor his progressive disease. In addition, while I was on my Mormon mission at the age of 20, I learned that one of my old soccer buddies had been in a traumatic boating accident and was now a quadriplegic. From the experiences with my father and also the knowledge about my friend's accident, I figured out early on that I wanted to learn to care for individuals with physical disabilities.

That being said, I tried to become fully engaged in the world of physical disabilities as soon as I entered medical school. In the beginning of my first year, I became involved with a nonprofit charity in North Texas called RISE Adaptive Sports. Taking part in this organization's activities has given me opportunities to become very comfortable interacting with individuals in wheelchairs, especially children. A majority of the events that I've volunteered for with this charity have been related to WCMX, or wheelchair motocross, but I've also helped with wheelchair rugby, softball, basketball, and sitting volleyball. During the WCMX events, adaptive athletes move themselves down skateboarding ramps in specialized skating wheelchairs. These adaptive athletes have a variety of conditions, from traumatic spinal cord injuries to congenital spinal conditions. As an adaptive sports coach, I participated by pushing, pulling, or carrying the athletes and their chairs to the top of the ramps in preparation for them to get ready for their runs. In addition to being an adaptive sports coach, I became the official liaison between our medical school and this nonprofit organization during my second year. This enabled me to help coordinate volunteers and lead the medical-student volunteers at large events. As I participated in more events, I became an assistant volunteer program manager for RISE, enabling me to help coordinate people during events, manage stations, participate in training

James Meiling

new adaptive coaches, and even run independent wheelchair events. I've also immersed myself in other adaptive sports organizations, such as the Special Olympics, Challenged Athlete Foundation, Össur Gait and Mobility Lab, and University of Arlington Collegiate Wheelchair Basketball.

Over the past two-and-a-half years of medical school, I've gained a great deal of experience in working with individuals who have physical disabilities, and I've decided that I want to dedicate my life to them. This has ultimately led me to pursue physical medicine and rehabilitation (PM&R) as my medical specialty of choice. I will be applying to PM&R programs all over the country at the next application cycle, with the desire to possibly further specialize through a fellowship in spinal cord injury, neurodegenerative disease, sports, or interventional spine medicine. I want to stay involved in adaptive sports organizations wherever I end up practicing. For me, one of my favorite parts about working with individuals with disabilities is seeing a person who had been repeatedly told all the things they can't do because of their sickness, accident, or condition, eventually gain their maximal amount of function, become physically active, and enjoy life again! I want to instill that kind of hope in the patients I treat. From the opportunities that I've had, I've seen the limitations of injury, but also the limitless desire of athletes and other individuals to participate in physical activity. I want to help people, like my father, to gain their maximal amount of function and to get the most out of their lives.

ANDREW COLLINS



Growing up in a small, rural community in eastern Kentucky, I realized from a young age that my heart and enthusiasm is for my community. I believe few things in life can provide the sense of community that service does. I have always lived a life of service to my home community, and I had every intention of continuing to do so when I entered the University of Pikeville–Kentucky College of Osteopathic Medicine (UP-KYCOM). During UP-KYCOM orientation, I met the president of the Student Government Association (SGA) and became enamored with the idea of leading

others into service. The small community where I grew up did not offer young adults leadership opportunities. Other than my time as a Sunday school teacher, I didn't have much leadership experience. It quickly became apparent that if I wanted to make the biggest impact on my community, I had to do more than just inspire myself. I needed to inspire others as well. I realized that serving as SGA president would give me that opportunity.

After my election as SGA president, I set goals for our service throughout the year. I knew if we were to be effective, I would need to model service leadership, promote team atmosphere, and lead by example. One of the most memorable service projects we organized was a food drive and disaster-relief project that benefited Johnson County, Kentucky. Flooding had devastated the county, and many people there were without food and shelter. In addition to our food drive, we recruited about 30 volunteers to go to the flood site to help with trash removal and relief efforts. It was one of the most rewarding projects I have ever worked on. Being at the disaster site and talking with those affected by that tragic event was both humbling and enriching. It was then that I saw my vision fulfilled—a College of Osteopathic Medicine that teaches its students how to use a healing touch in the exam room and how to help their communities by lending a hand to those in need.

Another project that helped define our SGA mission was the American Osteopathic Foundation (AOF) HumanTouch Student Leadership Project in Jonesville, Virginia, the birthplace of A.T. Still, who founded osteopathic medicine. The AOF had partnered with local charities to identify those in need and invited students from osteopathic medical schools across the country to volunteer one week during the summer. The purpose of the project was to build wheelchair-accessible ramps in the homes of disabled people unable to pay for these services. We brought eight people—the largest group from any school—and we had a very fulfilling week. This project was special because we interacted

Andrew Collins

directly with the people who benefited from our work. I understood just how meaningful this project was when one of the disabled individuals said, “This group has given me my life back. I can go outside again.”

We made great strides in serving the community during my year as SGA president. Students from UP-KYCOM had the highest service participation rate in the school’s 20-year history. More than 50 percent of the student body participated in community-service projects, logging in more than 8,000 service hours. That year was one of the most enriching for me as an individual, and it was a period of tremendous self-growth. If it wasn’t for the student body and our SGA executive board, we could not have met any of our goals.

Entering medical school, I knew I wanted to practice in a rural area, but it wasn’t until my year as SGA president that I realized family medicine would give me the opportunity to make the biggest impact on rural communities. Growing up in a rural area taught me how to be resilient, resourceful, and, most importantly, empathetic. But the qualities I developed as SGA president—including how to be an effective servant leader along with inspiring others to better themselves and their communities—will help me achieve my goal to become a rural family physician who provides the best care for his patients. The National Football League player and humanitarian J.J. Watt said, “Success cannot be owned—it must be leased with rent due every day.” For me, success is defined as living a life of service to my future community and patients.

AMBER NICOLE NEAL



I believe that scientific advancements aim to affirm and improve human life.

Our high quality of medical care is the result of discoveries by medical professionals seeking to address the causes of society's health problems. I am inspired by this legacy of researchers. As I have embarked on my own journey of discovery in the field of medicine, I hope that my passion will inspire others in my medical school cohort and beyond, and that together we can use scientific research and technology-driven medical diagnostics to treat human diseases. As a part of my undergraduate

degree at Sam Houston State University, I worked on two research projects: heavy metal (gold) bioremediation and formation of gold bionanoparticles, and molecular analysis of the *recA* gene in *Rhodobacter sphaeroides*. I was awarded a grant to continue my research throughout my tenure. I learned an array of molecular techniques, including construction of in-frame deletion, DNA cloning, DNA sequencing, polymerase chain reaction, bacterial conjugation, Integrated Phase Classification (IPC) analysis, and ultra-violet radiation (UVR) -induced DNA damage repair analysis. I performed statistical analysis of the data and presented my findings at American Society of Microbiologists' meetings and at multiple undergraduate research symposiums, where I received a scholarship and an award. With genetic research, we have generated new technologies for screening, prevention, diagnosis, and treatment of both rare and common diseases.

Research was an integral part of my undergraduate education. Upon arrival at the Edward Via College of Osteopathic Medicine (VCOM)-Auburn Campus, I recognized that I wanted to continue research advancement at the medical level. But I set a personal goal to step out of the lab and make progress toward clinical practice that would benefit me as a future physician. I became the lead in a manuscript and literature review that I titled "Non-Conformity in the Anatomical Description of the Duodenum and the Impact on Clinical Communication." This research allowed me to explore a lack of uniformity in clinical terminology, which could lead to miscommunication in the health care field that would be detrimental to patient outcomes. Our goal was to determine and implement a universal terminology for the duodenum. My research indicated that student doctors and teaching clinicians should utilize easily identifiable landmarks instead of vague, conflicting anatomical terms for the duodenum to help solve communication errors. I am honored to be a part of an institution that is on the cutting-edge of exciting discoveries that will further the field of medicine, and I am proud to play a role in these discoveries.

Amber Nicole Neal

My background in research will help me enrich the educational experiences of my medical school colleagues and motivate them to seek discoveries in medicine. Research has helped me build a wide array of skills, including teamwork and good communication. I have become more analytical, self-motivated, disciplined, and successful at problem solving. I was honored to present at the American College of Osteopathic Internists' Annual Convention and Scientific Sessions in National Harbor, Maryland, on October 11-15, 2017. I was the only medical student in my division among residents and fellows. I look forward to presenting at the American Medical Women's Association's 103rd Anniversary Meeting in Philadelphia, Pennsylvania, on March 23-25, 2018. I am proud that my manuscript, "Non-Conformity in the Anatomical Description of the Duodenum and the Impact on Clinical Communication," is under review for publication. Through these presentations, I have developed superior oral and written communication skills, which will serve me well as a physician.

A huge time commitment has not only gone into my education here at VCOM, but my research as well. I believe that conducting research should be an important aspect of every student doctor's professional career. As student doctors, we should cultivate, observe, and recognize the importance of the expansion that is taking place in the medical field. Advancements in medical practice today can lead to solutions to global health problems tomorrow. We should strive to diminish the impact of the greatest health morbidities, such as heart disease, cancer, infectious diseases, and diabetes. As we make new discoveries through research, we can further the progression of treatments that will heal our patients, families, and friends. At VCOM, I have sought research opportunities that allowed me to move away from the laboratory and into clinical medical practices that can improve the lives of patients. I believe that student medical research is helping to build the future of medicine and improve patient care. I hope to share these experiences and inspire my medical colleagues to discover themselves through research.

JASON SIMPSON



Jason Simpson is a second-year student at Edward Via College of Osteopathic Medicine–Auburn Campus (VCOM-Auburn) from Amory, Mississippi. He and his wife, Morgan, have been married for almost four years, and they have a two-year-old son named Owen. Jason graduated from Mississippi State University (MSU) with a degree in secondary math education before becoming the Baptist Student Union director at East Mississippi Community College. While there, he felt the pull toward medical school and began taking prerequisite classes at MSU. He was accepted

into VCOM-Auburn in the spring of 2016.

At the tail end of his first year at VCOM-Auburn, Jason and his wife became pregnant with their second son, Gideon. Sadly, it was discovered early in the pregnancy that Gideon had multicystic dysplastic kidneys, a condition that he would tragically not be able to overcome after birth. Here is that story from Jason’s perspective.

“On September 16, 2017, my wife and I held our day-and-a-half-old son Gideon in our arms as he passed from this life into the next. We found out early on that he had some type of bilateral multicystic renal dysplasia, but we are still awaiting testing to determine the exact cause. In the short time he was with us, Gid gave us so many little gifts, but the most incredible of these must be perspective.

Summing up our prenatal journey with Gideon is simple: it got worse every time we had an appointment. First, his kidneys were found to be huge and underperforming. On the next visit, they were bigger still, and there was no measurable amniotic fluid. We were told he did not even have a 1-percent chance of survival. We drove to Cincinnati, Ohio, to speak with the specialists there about a possible experimental treatment. And as we traveled this arduous road, my coursework at school began to cover the kidneys. I distinctly remember sitting in class when multicystic dysplastic kidneys were shown on the screen for the first time. It flashed up on the screen, the professor said it was not compatible with life, and that was it. This monster that my wife and I had been wrestling for weeks was taught in four minutes across three slides.

I wasn’t angry, or even upset. I just remember that I began to think back over all the other conditions that had been taught so briefly, the ones I had studied quickly so I could focus on the “heavy hitters” that may get their own lecture. And I began to realize the tremendous weight that each condition carried. I could not even begin to count the entirety of the diseases we had learned, but now I understood that so many of them resulted in heartache for those involved, entailing the loss of a child, a healthy life given sudden

Jason Simpson

brevity, or some other monstrous burden laid on the shoulders of the affected people.

The easiest thing to do after suffering a tragedy is put distance between you and anything that might remind you of your adversity. However, my wife and I realized something very early on. All around us are people who have experienced similar pain, and one of the most effective ways to approach monumental grief is to be hand-in-hand with someone else who has endured it firsthand. One day, I will be sitting down with a family to deliver a difficult diagnosis much like the one we received, and in that moment, I have two options. I could emotionally disconnect, presenting the facts and most likely offering a mumbled “I’m sorry” as I leave the room. Or I can help guide them through their new reality by allowing them to see into my own experience with grief.

Author Levi Lusko in his book *Through the Eyes of a Lion* talks about how experiencing tragedy is a “terrible privilege.” He means that one who chooses to use heartache to help someone else in similar circumstances can make a tremendous difference, but it comes at great cost. As you watch patients, friends, and family trudge through their grief, you will be taken back to re-experience what was most likely your darkest hour. However, I believe that that is the definition of true selflessness. As you continually re-enter that place of immense pain for someone else’s benefit, those you help will soon realize that the darkness that seems to be so insurmountable is undoubtedly conquerable.

Sharing such hope is one of the greatest ways a physician can care for patients. To be clear, we aren’t giving patients a false hope that we will without a doubt cure what ails them. That would be undeniably cruel. Instead, we are providing a light in the darkness, the knowledge that the cloud hanging over them will break. As a future physician, I am resolved to stay vulnerable for this very purpose. The day that I close my emotions off from my patients is the day that I cease to truly care for them.

Gideon lived for only 34 hours and 42 minutes, yet his profound influence on me will impact every patient that ever enters my practice. Because of him, I hope to hurt with each family I care for. Being jaded in the face of such sadness would allow me to escape some of the pain, but uniting with those who hurt to give them courage in their fight is, to me, what being a physician is all about.”

KEVIN LONDE



There is a lot of debate currently on the use of tamoxifen for treating patients with estrogen-receptor-positive breast cancer. The focus of the debate is tamoxifen's mechanism of action, which involves an estrogen-receptor antagonist in the breast but an agonist in the uterus, which causes an increased risk of uterine cancer for those women who use the drug.

Our research targeted PC12 cells that were transformed with neuron growth factor (NGF) into neuronlike cells to express both estrogen beta (ER β) and sex hormone-binding globulin (SHBG) receptors. Our belief was that the SHBG would be carried into the cell via a transport protein, unlike the prevailing belief of steroid entrance to the cell via passive transport. With our research, we have found that the ER β receptor and SHBG interact with each other in the membrane of the PC12 cells, which has led us to conclude that SHBG does, in fact, get transported into the cell and into the nucleus, unlike current theories. This finding will allow for further investigation into the use of tamoxifen, being an agonist and antagonist depending on the site of the body, and how it gets transported into the cell. We have proven that not all steroids are passively transported through the membrane. Rather, some may be actively transported, such as in our model with PC12 cells, and we believe this may be the case for tamoxifen.

During my medical career, I plan on analyzing the use of osteopathic manipulative medicine (OMM) in postoperative patients, including their recovery time and hospital length of stay. Desiring to enter the field of surgery, I want to expand this field by making OMM part of an osteopathic surgeon's daily routine. The biggest reason for lengthy hospital stays after colon surgery is postoperative ileus, which can lead to placement of a nasogastric tube due to excess vomiting and potential aspiration pneumonia. These complications can be easily prevented with OMM immediately after surgery. I would like to run a study and prove that OMM in postoperative colon care decreases the need for a nasogastric tube, decreases risk for aspiration pneumonia, decreases hospital length of stay, and increases speed of recovery for the patient.

Research is the way we advance medicine every day. Without it, medicine would reach a stall and there would be no more progress. Medical advancement is dependent upon students and physicians who are willing to try out ideas, including running clinical trials for the betterment of tomorrow's medicine. I want to be a part of tomorrow's medicine by actively searching for new ideas and implementing them into my everyday practice.

DEEVEE SANCHEZ



In a small clinic room in rural South Carolina, a patient, a premedical student, and a student doctor sit in silence. Counting the crest and troughs of breaths, their inhalations and exhalations synch for 10 still seconds. Slowly, they open their eyes and smile, as if to thank each other for the moment.

“How do you guys feel?” I ask, breaking the silence. The premed student responds, “That felt nice.”

We turn to Debra, a patient at the Anderson Free Clinic (AFC) who suffers from worsening anxiety and depression. “I think I can do this when I start to feel overwhelmed at home,” she says. “This is the most relaxed I have felt all week.”

Overjoyed with her response, I explain that she can use this tool whenever she starts to feel anxious. The rest of the patient encounter is spent reviewing her medication list and making changes as needed.

Patients like Debra rely on the AFC for their health care needs. The AFC is a non-profit clinic that serves low-income uninsured residents of Anderson, South Carolina. Under astute preceptorship, I saw two to four patients biweekly at the AFC from August 2016 to May 2017. I wrote prescriptions filled at an onsite pharmacy, referred patients to specialists, performed such procedures as joint injections, wrote clinic notes, and practiced coding and billing. Working at the AFC challenged me to grow as a student doctor and solidified my resolve for family medicine. The experience identified three areas in medicine that I will pursue as a future physician: nonpharmacologic management, lifestyle modification, and access to health care in underserved populations.

The benefits of nonpharmacologic management for my patients became apparent early on. The AFC cultivated my skills as an osteopathic physician and allowed me to schedule appointments for osteopathic manipulative treatment (OMT). When used synergistically with medications, OMT enhanced patient relief and enabled some patients to decrease pharmacologic intervention. Moreover, introducing breathing exercises to anxious or depressed patients improved overall symptoms. Nonpharmacologic intervention will be integrated into my practice as a future primary care physician.

Lifestyle modifications and education are invaluable in the world of primary care. At the AFC, a large portion of the patient population had uncontrolled diabetes and hypertension. When I assumed responsibility for my patients in August 2016, I was still solidifying my medical knowledge, while simultaneously learning ways to communicate effectively. I grew exponentially. Diabetic patients were asked to bring a glucometer/ blood-sugar log and a three-day food diary to each visit. The patients that complied with

this request shared one thing in common: Bojangles. It was astounding to see how many patients did not understand how or what to eat. I began to tailor my diabetic visits to include nutrition education. As a future family physician, nutrition and diabetic education will be an integral part of my practice.

Lack of resources, education, and access to health care marginalizes low-income families across the United States. At the AFC, I treated many patients like Xiomara, a Spanish-speaking mother of three whose debilitating lower abdominal pain hindered her ability to work and led to multiple visits to the emergency department. My preceptor and I scoured her hospital records, finally finding a 6-7 cm ovarian mass on ultrasound and a remote history of pelvic abscess. With the help of the clinic, Xiomara underwent surgery to remove a large cystadenofibroma, alleviating her pain and allowing her to return to work.

Although I was happy about her recovery, I couldn't help but think: Why hadn't anyone ever given her this sort of care before? Why did she fall through the cracks?

Bringing this sort of care and understanding to disadvantaged patients is what I hope to do with my degree. Although family medicine is dynamic and constantly improving with new medications and diagnostic technology, progress lies beyond the prescription pad. Physicians and patients must collaborate and understand that meaningful, positive change can be attained through education and small lifestyle modifications.

ZACHARY DRENNEN



The importance of research in the field of pain medicine cannot be overstated. Many patients treated by pain specialists have conditions with poor clinical outcomes that often result in severe long-term disability and pain. With few options, many patients with chronic pain seek opioids for pain relief, which can add to the growing opioid-dependence epidemic. Developing new and improved treatments for chronic-pain disorders requires an interdisciplinary approach of basic and clinical research translated into clinical practice.

My goal as an osteopathic physician is to utilize osteopathic manipulative medicine (OMM) in combination with pain therapeutics to provide a multifaceted treatment plan for patients with chronic pain—a plan that is both effective and affordable. As I work on my OMM training and skills development, my research activity is focused on improving current pain therapeutics and procedures. Low back pain causes more disability globally than any other condition and is estimated to cost the United States more than \$100 billion per year, primarily due to lost productivity and wages. Schwarzer and colleagues reported that sacroiliac pain is found in 13 percent to 30 percent of patients with low back and buttock pain.

The origin of pain is not always well understood and, therefore, a multitude of mixed evidence exists regarding the many different treatment options. The current treatment for sacroiliac joint pain involves both monopolar and bipolar radiofrequency ablation (RFA). This is a minimally invasive procedure that uses an electric current to heat a small area of nerve tissue, stopping it from sending pain signals. The two forms of the procedure both involve the same general physiologic background. Monopolar RFA, which has been studied extensively, uses a single electrode with a grounding pad on the patient to complete the electrical circuit. Bipolar RFA, which has been studied far less, uses two electrodes. The two-electrode bipolar RFA technique offers the ability to create much larger lesions by increasing the interelectrode distance (IED). This has great advantages for treating sacroiliac joint pain due to the overall size of the joint. My research focuses on this application of RFA.

Burnham and colleagues reported on the use of the bipolar RFA technique to treat sacroiliac joint pain, finding that 33 percent of their subjects experienced a greater than 50-percent relief of pain at six to nine months. The primary reason that so few patients experienced pain relief was due to the RFA procedure missing the desired nerves. Building on this finding, my research mentor, Dr. Provenzano, and I creating larger

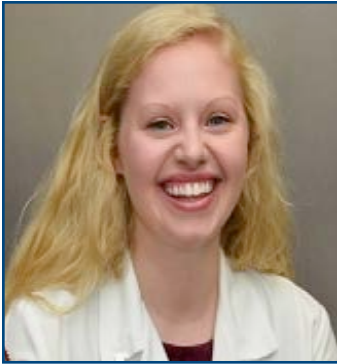
Zachary Drennen

lesions to increase the chances of accurately targeting the desired nerves, with the rationale that if lesions can be significantly increased in size, the procedure should be more efficient and effective. Our main approach for increasing lesion size was through the use of saline solution pre-injection into the tissue. Previous research by the Provenzano lab showed that the pre-injection of saline of various concentrations, up to 3 percent, into chicken breast dramatically increased lesion size in both monopolar and bipolar approaches. In our study, we proposed that increasing the saline concentration further would be even more effective for lesion formation. To test this hypothesis, we increased the pre-injection saline concentration to 8 percent. We then measured lesion formation as a function of IED and time, using defined lesion parameters over the 190-second lesioning period at 10-second intervals.

Our results indicated that the 8-percent saline pre-injection increased the IED at which successful lesions were formed and produced significantly larger lesions at each IED tested. Additional tests at other sodium concentrations are underway, and we are currently working to analyze the enormous amount of data generated to determine quantitatively the relationships between sodium concentration, IED, time, and lesion formation. We plan to report the results of this study in poster form at conferences and to publish the study as soon as possible.

Our research is already being implemented in patient trials. Prior to our studies, very few physicians were using pre-injection of saline for bipolar RFA. However, after reporting our results, we have learned that many physicians are now using saline pre-injection. As a researcher, it is gratifying to see my work being implemented in the practice of pain medicine. As an osteopathic physician, I plan to be an advocate to the pain-medicine community about how OMM can help with treating chronic pain, especially in combination with bipolar RFA therapy. As I extend my pain research into my future clinical practice, this would be an excellent demonstration of how to translate basic research into clinical practice for the effective treatment of patients with chronic pain.

KORTNEE M. KOZIARA



Members of the osteopathic medical community hold a unique definition of osteopathic medicine within themselves. This definition is essential in outlining their roles within, and contributions to, the profession as a whole. Throughout the course of a career, osteopathic physicians vary in their degree of engagement, while maintaining fulfillment in both their personal and professional lives. Early on in my journey, I recognized that complete engagement is fundamental to reaching maximum success as an osteopathic physician.

As student government president at VCOM-Virginia, I was responsible for sitting in the American Osteopathic Association's (AOA) House of Delegates as the voting student delegate for the state of Virginia. I was empowered by the many passionate osteopathic physicians representing not only their individual states, but osteopathic medicine collectively, and their abilities to change regulations within medicine. The most profound change during my time as student delegate was the introduction of the Single Accreditation System (SAS), a system proposing to unite graduate medical education for osteopathic and allopathic medicine. During the proposal of the SAS, the once united room of osteopathic physicians stood divided, torn between maintaining a separate identity from their allopathic counterparts and joining together for the sake of medicine. Since the adoption of the SAS, osteopathic medicine has received more recognition than in years past, presenting the opportunity to highlight similarities and differences with allopathic medicine.

Patients are beginning to identify attributes common among osteopathic physicians as characteristics important to quality patient care, thereby prompting nationwide education focused on osteopathic principles and practices. Taking this into account, I coordinated a hands-on demonstration of osteopathic manipulative medicine (OMM) on the local college campus, Virginia Tech, during National Osteopathic Medicine Week. Several VCOM classmates offered treatments to students, staff, and community members on site, while providing basic information about osteopathic medicine. Three years later, the student government association continues to organize this annual event to expand awareness of osteopathic medicine within the community.

As part of the new generation of osteopathic physicians, I am tasked with upholding the traditional values and culture of our profession while looking toward a future of increased integration with the allopathic community. Because of my involvement during the initial movement to combine graduate medical education, I understand the

Kortnee M. Koziara

importance in maintaining osteopathic identity both locally through community outreach and nationally through organizations, such as the AOA, during the transition. Such involvement is necessarily lifelong, but then, so are the duties of practicing medicine

EVAN WARE



Med school was great! I had a great roommate, a great group of friends, and a great study group. I was excited to finally be finished with the “Foundations of Medicine” block and ready to start learning more. I had just received my white coat on Sunday, October 30, 2016, and couldn’t have been happier.

That following Friday, my study group worked all afternoon so we could go out for dinner and drinks. The next morning, I didn’t feel well, but I figured it was because I was a little bit older and might need a few extra hours to recover from partying. Over the next 36 hours, I became progressively weaker and unable to keep fluids or solids down. On Sunday night, I had my roommate drop me off at the emergency department (ED) for what I assumed would be two liters of fluids and a discharge—I even told him I would just grab an Uber home. What I didn’t know was that I was suffering from fulminant hepatic failure, I would be flown to the University of Virginia in about five hours, and I would receive a liver transplant in 36 hours.

I had been perfectly healthy. “How could this be happening?” I kept wondering to myself. None of my answers to the transplant team’s questions raised any red flags. My labs came back negative for the most common causes of liver failure, yet I continued to decompensate. The next day, Monday, at 6 p.m., we made the decision to transplant. Three hours later, the team reported back that a good match had been found and asked how I wanted to proceed. Due to the ventilator, all I could do was give a “thumbs up,” but that was enough. At noon the next day, the operating room (OR) team came in and said, “It’s time to go.” I remember being wheeled to the OR, hugging my parents, giving the surgeon a thumbs up, and then darkness.

The next thing I vaguely remember is two-and-a-half days later, Thursday evening, speaking with my parents and sleeping off and on. The first concrete memory I have is from Friday, when two of the physicians I had worked with in the ED for several years came up to visit. One of them is a huge Cubs fan, and he gave me a Cubs hat, telling me, “Dude, if the Cubs can win the World Series for the first time in 108 years, you can pull through this no problem.” He was right.

Over the next four weeks spent at home, I regained my strength, settled into the routine of immunosuppressants every 12 hours, and was in constant contact with my friends and the administration at school. We reached the mutual consensus that the best option would be to withdraw from the class of 2020 and reenter school with the class of 2021 in the fall of 2017. Here I am now, almost one year postoperation, about to complete block

Evan Ware

I (for the second time) with two great roommates, two great groups of friends, two great study groups (one for the current material and one for next year's), and an entirely new outlook on life.

Pursue what you want and achieve what you want. When life doesn't go exactly like you plan, just roll with it. Everything happens for a reason, and it certainly isn't worth sweating the small things. I was wrong on October 30, 2016—I could have been happier, and I am now. I am happy to be alive and well and continuing to pursue a career in medicine.

For everyone who is just as curious of a person as I am, the cause of my fulminant hepatic failure is still under investigation as both the lab work and the pathology results were inconclusive. It is believed that I was somehow exposed to a toxin in the 48-72 hours prior to presentation.

PEJMAHN EFTEKHARZADEH



When trying to develop the best medical school curriculum, administrators, faculty, and staff always want the best for their students. They are able to provide them with a plethora of different tools and resources that they believe will benefit the students in understanding material. All these investments are excellent ideas, but why not begin by first asking the students what they prefer? My research project, “Outcomes and Benefits of Student-Driven Curriculum Assessment,” is focused on evaluating the effectiveness of the curriculum at the West Virginia School of

Osteopathic Medicine (WVSOM). The research team, including myself and four other medical students, developed a questionnaire in order to assess the factors that make for an effective lecture. After every lecture, the research team completes a questionnaire evaluating the lecture.

The questionnaire first allows students to categorize the style of learning in which the material was presented: independent learning or lecture. In addition, items direct students to indicate their recommendations for an appropriate duration for the lecture. The answers allow professors to determine how much time students need to understand a particular topic, adjusting their future presentations accordingly. Next, items ask if an active learning strategy (ALS) was used, such as active clicker questions, team-based learning, role playing, think-pair-share, or clinical case discussions. There is also an “OPP integration” component, asking students whether osteopathic principles and practice were incorporated into the presentation. The last item asks students to estimate how much information was retained at the end of the lecture based on four options: 1%-25%, 26%-50%, 51%-75%, 76%-100%.

At the end of the year, the research team evaluated the questionnaire responses. We determined that there was a positive correlation between the amount of material retained and the number of different ALSs used. According to student ratings, when professors include more ALS, students retain information longer. Certain difficult topics in medicine are not easy to teach, so it is important for professors to know the best way their students can retain content. We can further apply this concept of feedback learning and break down those topics that are better understood with ALS. This would be an important research opportunity in the future. Our research was accepted for presentation at the Joint AACOM and AODME (Association of Osteopathic Directors and Medical Examiners) Annual Conference in 2017. The research team discussed the benefits of student-driven curriculum assessment, the positive correlation between ALS

and retained information, and the possible impact on future curriculum development of making lectures more proactive. After our presentation, we realized that not only can this research be adopted by many institutions, but it could also be used in other higher learning disciplines besides medicine.

Most feedback systems are provided to students either at the end of the year or after every learning module. The flaw in this method is that too much time has elapsed between when the lectures are given and when the feedback is generated by the students. Moreover, such surveys are often inadequate in providing a thorough evaluation, as there may be close to 25 lectures covered by the one survey. By contrast, our method focuses on each lecture individually, with the questionnaire completed immediately after the lecture. This eliminates both of these confounding errors.

Throughout my high-school, undergraduate, and graduate career, I maintained a passion for teaching other students. Having participated in numerous tutor programs in high school, holding four teaching-assistant positions in my undergraduate career, and helping my peers understand material during study groups in medical school, I have always enjoyed explaining and simplifying difficult concepts in ways that are understandable and retainable. Working as a primary care physician with the aim of becoming an associate professor at an osteopathic medical college, I would enjoy the opportunity of exploring different methods of teaching to help students retain new information longer and to help shape the curriculum. If students have an excellent foundation of the academic basics because they were taught effectively, they will practice the best medicine and become fully competent osteopathic physicians. After performing academic research in my first and second years of medical school and presenting at the JAA conference, I realized that my research can help shape the curriculum of WVSOM in future classes by improving teaching practices. I will apply my passion for teaching and my experience in research by continually adding ALS to my lectures and incorporating student input in my teaching strategies via feedback surveys, with the main goal of helping students better retain difficult medical content.

NICOLE PEPE



Research is a fundamental component of medicine today. It is what drives the way physicians decide to treat patients. Through evidence-based medicine, physicians are able to make the best treatment plans for their patients with confidence in their decision making. Without research, many of our treatment plans and practices would not exist.

As a medical student, I believe it is important to be involved in research and to understand how to relate research findings to the clinical setting. My research project, “Effect of Vaginal Estrogen Delivery on the Vaginal

Muscularis in a Rodent Model of Vulvovaginal Atrophy with Menopause,” contributes significantly to female health. This project pertains to many female reproductive and urological health conditions, including vaginal atrophy; prolapse of the vagina, uterus, and bladder; and pelvic floor dysfunctions. These conditions lead to such clinical symptoms as vaginal pain, itchiness, and burning; difficulty urinating; and dyspareunia. Previous work in our lab showed the ability of local estrogen to regenerate the vaginal epithelial layer of rodent models of menopause. My project showcased evidence that local estrogen can restore the structure and function of the vaginal muscularis layer as well.

I believe my research project is unique in that it can be applied to many disciplines of medicine. There are many different specialties that address female health-related issues. A family medicine physician, a gynecologist, and a urologist can all prescribe estradiol cream and be the primary caregiver for the female patient. Being able to recognize female health dysfunction is important in nearly all specialties, not only so that the physician can provide appropriate treatment, but also because many conditions are detrimental to the female patient both physically and mentally. Many times, a female patient is embarrassed to discuss certain health issues with the physician. A patient feeling uncomfortable in the examination room is something all physicians, especially osteopathic physicians, should diligently try to prevent. A physician who is educated in female health and who feels comfortable discussing such issues will make a patient feel more inclined to seek treatment.

As an osteopathic medical student, I believe that it is important for me to start becoming comfortable discussing complicated and potentially awkward topics with my patients. Reproductive and sexual health is a subject that many medical students try to avoid in their patient encounters. But the more practice I get discussing such issues now will prepare me for a future in which patients are willing to discuss their concerns with me and I, in turn, will be able to provide them with adequate treatment. I believe my

Nicole Pepe

research project not only provided me with invaluable education, but it gave me the confidence and incentive to discuss such information with peers, mentors, attendings, and, most importantly, patients.

As a future physician, I plan to not only practice evidence-based medicine, but to play a part in creating it. A physician has many responsibilities, including taking care of patients and staying up-to-date on current medical recommendations. The mind of a physician is full of countless random details, dosages, and medications. But a physician should strive to never lose creativity. It is the creative mind that comes up with an innovative technique to treat a patient, and produces research to prove the validity of the technique. Research is a way for physicians to share their creativity with peers and ensure that their ideas are being used to treat as many patients as possible. Physicians understand the issues of their patients more than anyone else, and they have the opportunity to guide the ways in which research advances medicine to improve patient care. As a future osteopathic physician, I plan to use my creativity to continue advancements in women's health.

ASHLEY RUBIN



“Asante sana daktari. Asante sana daktari,” said a 36-year-old man while he was crying and hugging me goodbye. He had said, “thank you doctor, thank you doctor,” in Swahili.

At the time, I was volunteering in a rural hospital in the mountains of Kenya. It was 3:00 a.m. when I received a call from the hospital doctor that a child was being brought into the hospital, and I needed to get there. I arrived at the hospital before anyone else, and a motor bike pulled up with an unconscious six-year-old boy who was convulsing in his father’s arms. His dad threw his shaking child into my arms and pleaded for help. We were able to stabilize the boy, and within a few hours he was alert and ready to eat. His family could not afford malaria medication, and the disease had progressed until he was brought to the hospital that night. His father thanked me when he was discharged, hydrated and healing, the next evening.

It is in times like these that I realize how much I have learned in medical school and how much more I still must learn. During my one-month stay, I would usually work 12 hours a day and then go to eat dinner with the family I was living with. After dinner, I’d do “house calls” with the medical director for the rest of the night. Every other day, we would get on motorbikes and travel hours into the mountains to set up clinics in village schools. When we weren’t conducting outreach clinics, I would be in the hospital all day. There were no nurses or pharmacists—only a couple of doctors and a laboratory technician.

During those six weeks, I not only learned how to be a nurse, receptionist, lab tech, and pharmacist, but I learned how to be a great physician. I believe it is important for physicians to understand what the other members on the health team do to better appreciate their work. This helped me understand the different roles in health care, and how to help make my peers’ jobs easier when possible. I saw approximately 60 patients a day, most of whom could not even afford ibuprofen (approximately 15 cents). I learned how to barter grain and balance costs to help make medication more affordable for patients, while still ensuring that the hospital could pay its bills and staff. I attended and presented at meetings with the minister of health and with grant committee officers regarding funding for the hospital, leading to a \$50,000 (U.S. dollars) grant.

Having worked most hours of the day and being on call every night, I learned what it truly meant to be “exhausted.” This taught me a skill that I believe many practicing physicians still don’t understand—how to maintain a work/life balance. After a week into my stay, I started practicing once a week with the village dance team. I simultaneously made

Ashley Rubin

friends and had a great workout. In the fifth week of my stay, we participated in a country-wide dance competition with teams from all over Kenya. We won first place, with me as the first and only non-African to dance on a team. In addition, I learned to take time for myself by exercising in the morning and spending “family” time (with the family I lived with) on Sundays. This was a very important skill I learned, because it provided me with continual energy and excitement to go to work after I recharged.

This experience will help my future practice as a family physician, because I not only learned an immense amount of medical knowledge and clinical skills, but I also learned the other aspects of running a hospital and clinical team. I learned how to advocate for my patients, without doing it at the expense of the hospital administration. I learned how to think on my feet, improvise, and adapt to my surroundings regardless of where I was. I taught the physicians in my hospital osteopathic manipulative treatment (OMT) skills that they still use to this day. Practicing OMT on patients who had never heard of such a practice gave me the skillset to learn how to explain what I was doing while treating my patients, helping to lead to better outcomes. I learned to treat my patients with compassion and care, yet still completing proper documentation in a timely manner. This helped me to be appreciative of the medical equipment I have access to, while always fighting for more for my patients.

AMANDA EMMERT



Health advocacy and preventative medicine in the pediatric population is something that I have always been particularly passionate about. As a former public health student, I strive to understand the ways in which I can reach low-resource children and help to foster their best possible growth and development. Childhood obesity is a devastating phenomenon in the United States, though it is largely preventable. According to the Centers for Disease Control and Prevention, 12.7 million children and adolescents in the United States are classified as obese. Studies show a

direct correlation between obesity that begins in childhood and many comorbid conditions, such as diabetes mellitus and heart disease, as well as an overall increase in morbidity and mortality. Because the link between childhood obesity and decreased quality of life and life expectancy is so clearly demarcated, I am eager to do everything I can to address this issue as early as possible and to give children the skills they need for a successful and healthy adulthood.

Beyond the association between obesity and poor life quality, studies show that obesity is also correlated with low socioeconomic status, with children from low-income households disproportionately afflicted. The small community I am from is considered economically depressed, with 32.5 percent of children living in poverty. For many of these children, eating healthy is a foreign practice. As a medical student, I decided that I shouldn't have to wait until I was a pediatrician to impact the pediatric population. So I created "Kids in the Kitchen," a cooking class for local adolescents to teach them the skills required to prepare healthy and nutritious meals, for both themselves and their families. I designed the class to be held once a month at the local Boys and Girls Club, and I wrote up a class curriculum, complete with activities and additional information for families to make the class more collaborative and enjoyable for the children. When these kids come to my class, they are given a chef's hat and a brightly colored chef apron, and they are provided with all the ingredients to make the recipes for that day. I found that through this class, these children are being exposed to nutritious foods that they might have never tried without this experience, and they are learning new concepts about their nutrition that they may not have considered. Each month entails a new topic, ranging from foods that are good sources of fiber (and why that's important) to "superhero" fruits and vegetables. I've taught the class for six months this year, with an average of four to six children in attendance, and my hope is that the curriculum I've created lays the groundwork for others to carry on the class in the future.

Amanda Emmert

Investing in the health of children is an effort that should begin in early life stages and is greatly influential in shaping future health practices. Through my cooking class, I am planting seeds for health awareness and instilling in these children the nutrition foundation from which they can build as they grow. This experience has helped develop my own knowledge in nutrition and built my self confidence in being able to convey this information to children and their parents in a way that is easy to understand. I plan to use this experience as part of the foundation of my efforts to advocate for vulnerable populations and to combat the trend of childhood obesity.

CHRISTINA BOHR



As a predoctoral teaching fellow in neuromusculoskeletal medicine (NMM)/osteopathic manipulative medicine (OMM), I had the unique opportunity to lecture for the first- and second-year class while still in medical school. The primary focus of the experience was teaching OMM, but I was also involved in various administrative duties within the OMM department and outside projects. Throughout this experience, I took every opportunity to positively impact the university, the community, and the osteopathic medical profession.

The Western University of Health Sciences/College of Osteopathic Medicine of the Pacific has a highly structured OMM curriculum. As a fellow, I was tasked with teaching students an osteopathic approach to medicine and osteopathic manipulative techniques. I generated and presented lectures about various manipulative techniques for the first- and second-year osteopathic medical students. By being an active part of the curriculum, I relished the opportunity to give back to the university. Moreover, I was in the unique position of being an upperclassman who had daily interactions with preclinical students. Outside of the OMM curriculum, I presented on such topics as OMM board review, preparation for rotations, and pathological conditions, including congestive heart failure. These lectures were well-received, and students found them valuable.

I took every initiative to share my knowledge and experiences with the next generation of health care professionals. Fellows are permitted to help precept OMM screenings at multiple free health fairs that are organized by clubs on campus throughout the semester. As a preceptor at these events, I interacted with patients and helped guide students in their treatments and plans. In some instances, our team detected previously undiagnosed illnesses. The students were excited to learn when I taught and employed new techniques, in addition to the standard curriculum. The patients appreciated the time we spent addressing their health concerns, including often alleviating their pain. I enjoyed the opportunity to teach the patients and students how to continue to live healthy lives.

Above all in my teaching, I attempt to enrich the OMM curriculum to help osteopathic medical students become skilled, proud physicians who appreciate the value of their manipulative techniques. As a fellow, I and the other fellows interview prospective medical students. Our input helps steer the direction of osteopathic medicine, ensuring that future osteopathic medical students carry on its values. My goal is to inspire future DOs to utilize their osteopathic techniques and principles as often as possible, so that

Christina Bohr

they may become part of their future practice. Hopefully, this will help osteopathic physicians retain their unique identity and inspire more prospective physicians to consider a career in osteopathic medicine.

My experiences as a fellow have allowed for more self-growth than I could have imagined. My love for teaching has been fortified. After this experience, I have not only learned to be a better teacher, which I will apply during residency and beyond, but I have also become more interested in a career in academic medicine. I plan to return to teach at a university in the future to inspire the next generation of physicians.

STARR HARMON



It is said that a doctor never forgets the first time that he or she loses a patient. For me, it happened on a warm, breezy Monday, when I was an eager third-year medical student working in the emergency department. I was giddy over every laceration that walked through the door and every trauma that was called over the intercom. I was loving every moment, all the rush and the variety, when, in a moment, a deep venous thrombosis turned into a tragedy. I remember sitting with this patient, gathering her history and performing her physical while also chatting and passing smiles

and laughter. When she got out of bed to go to the restroom, the thrombus was loosened and traveled straight to her lungs. Her oxygen saturation dropped in an instant. Between bouts of vigorous chest compressions, I was frantically trying to place more IVs for better access. The code went on for what seemed like a lifetime, and, unfortunately, she passed.

In that moment, I had no issues with being fully engaged. Getting a pulse back—that was all that was on my mind, nothing else. I was 100-percent present without thinking twice. The real struggle was attempting to fully engage after the misfortune. I walked back to my next patient carrying an apple juice, which she had asked for before the code. I gently stated with a forced smile, “I’m sorry this took me so long. How are you doing?” My mind felt a million miles away, but in that moment, the patient before me had to have my full focus. I realized that no matter what has happened in my day, big or small, I had to be present and attentive to each patient that sat before me. It is easy to engage with the big stuff; it’s the little stuff that gets lost in the shadows.

During this past year, I lost both of my grandparents. The first passing was expected. My grandfather had battled congestive heart failure for long enough and was simply too exhausted to go on. A few months later, my previously healthy grandmother had a stroke that reunited them. I was in the middle of my clerkship rotations during both losses. The days following each funeral, I found myself completely absent. Patients would speak, but my mind was in a cloud of memories. It wasn’t hard for me to engage with my family. I was fully present in every moment, never looking side to side. But my ability to engage in the little stuff in the shadows of my ache, that was the true test of my focus and drive. After a few days of mourning, I continually reminded myself that my grandparents were my biggest fans. They would love nothing more than to see me engaged and focused on those I was called to serve and care for. They would be proud of my grit. To make an impact on the patients and on the osteopathic medical community in general, my patients

Starr Harmon

need all of me. I would be lying if I said that I am now fully engaged in every moment, but many situations in this past year have taught me of the importance of this skill, and I am better for it.

As a future osteopathic physician, I expect endless distractions. From juggling multiple patients at the same time to keeping an entire staff feeling positive and driven, it will be no easy task. Simultaneously, I will need to ensure that my home life is balanced and functioning well. The task may seem impossible at times, but the best way to balance all these aspects of life is to fully engage in the moment with the people who are in front of me. On paper, it seems reasonable enough—be attentive to the person in front of you. But in actuality, it can sometimes be extremely difficult to do. I am sure that most physicians can recall those times when they were taking a history on a patient and half way through the rehearsed questions, they realized that they did not catch a word of the patient's answers. They were thinking of what to eat for lunch or that bill that they forgot to pay, or perhaps waiting on a pathology report for a possible cancer diagnosis or thinking of a female patient in labor. They then casually re-ask the questions, trying to make it seem like a clarification, and move on to the physical. But to make the full impact that we as osteopathic physicians can make, we must always be present. We must fully engage because our patients deserve the best from us.