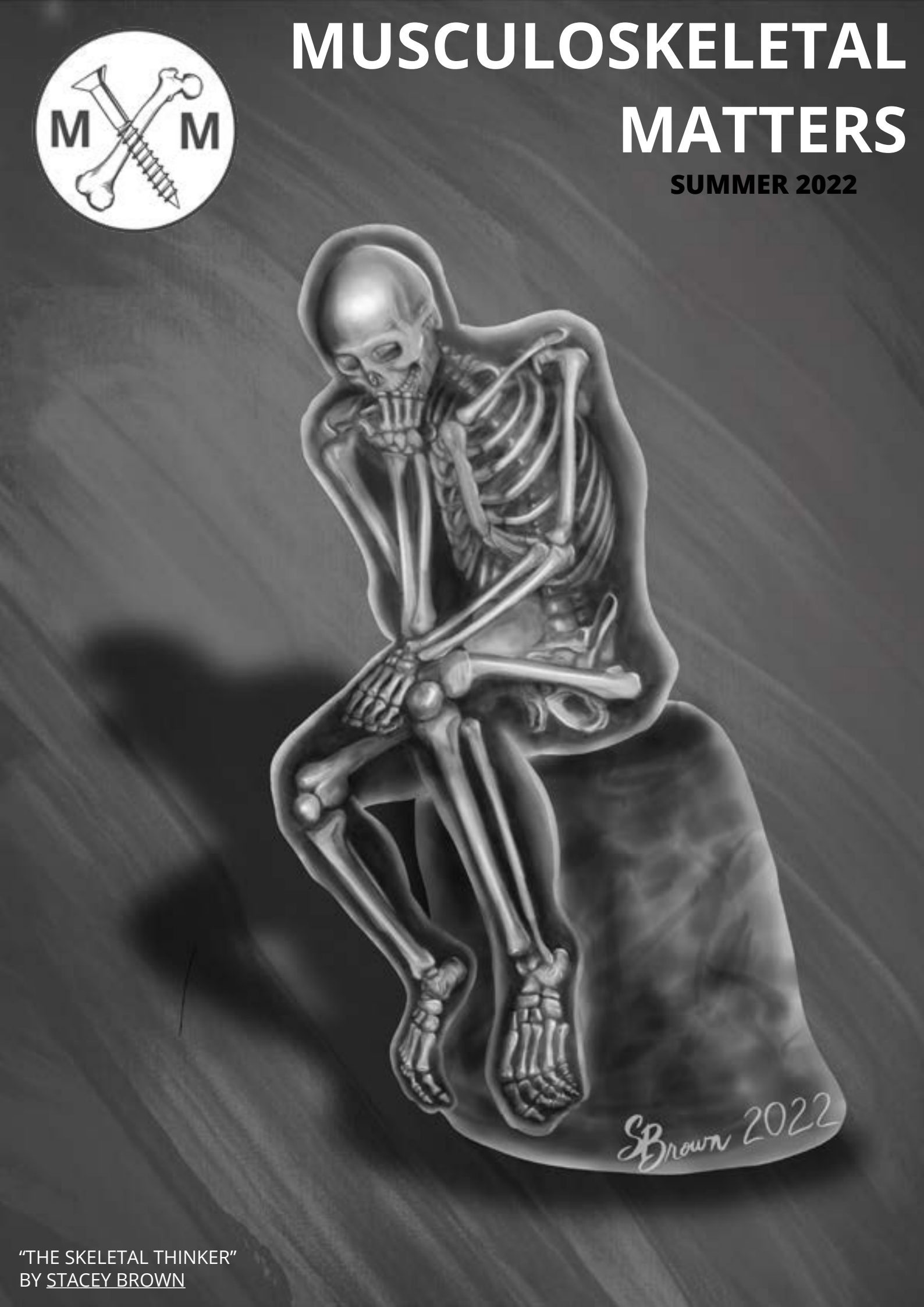
MUSCULOSKELETAL MATTERS

SUMMER 2022



"THE SKELETAL THINKER"
BY STACEY BROWN

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GET MOVING WITH WALK WITH A FUTURE DOC

NOAH HOFFMAN & EMILY GRIMES

Walk with a Future Doc is a program that combines promoting healthy lifestyles through physical exercise with educating communities about health topics. Walk with a Future Doc is the medical student program within the larger organization Walk with a Doc, which was founded in 2005 by Dr. David Sabgir. Frustrated with his inability to affect behavior change in the clinical setting, Dr. Sabgir invited his patients to go for a walk with him in a local park on a spring Saturday morning. To his surprise, over 100 people showed up, energized and ready to move. Since that first event in 2005, Walk with a Doc has grown as a grassroots effort with a model based on sustainability and simplicity. Geisinger Commonwealth's chapter of Walk with a Future Doc was started in 2018, led by medical students in the Family Medicine Interest Group and advisor Dr. Jennifer Joyce.

Noah Hoffman (2022-2023 GCSOM Chapter Leader) and Emily Grimes (2021-2022 GCSOM Chapter Leader, 2021-present National Student Advisory Board Vice President) were asked how Walk with a Future Doc has impacted their medical school experiences, which are presented below.

"At some point in our education, we all learn of Newton's laws of physics. Paraphrasing Newton's first law, a body at rest tends to stay at rest while a body in motion tends to stay in motion, unless acted upon by an outside force. For people across the world, this concept of inertia has never been more clearly exemplified than by the COVID-19 pandemic. Many previously bustling aspects of life came to a halt due to the outside force that has been COVID-19. Geisinger Commonwealth School of Medicine was not left unscathed: most classes became virtual out of necessity to protect everyone in our community. Days previously filled with activity, movement, and interaction became days consisting of sitting in front of computers, logging in to one Zoom meeting after another.

Personally, my life felt as though it had come to a screeching halt. The constant feeling of needing to study that is common for all M1s (and most M2s) led to weeks of physical inactivity, which led to a fatigue that felt surprisingly worse than fatigue from exercise. This fatigue would not go away after a warm shower or a long rest. I needed movement and I needed interaction other than through a computer screen. I was a body at rest looking for an outside force to act upon me to get me moving again. Luckily, Newton's first law did not let me down: I found Geisinger Commonwealth's chapter of Walk with a Future Doc.

Throughout the pandemic, Walk with a Future Doc has provided students and community members with the opportunity to safely come together to promote healthy lifestyles through walking and forming relationships between future providers and their future patients. Each monthly Walk encouraged me to get moving but never pressured me to go at a faster pace than I could handle, as the program emphasizes that we are all differently abled and should be able to run (or walk) each of our races at our own speed, figuratively and literally (if you are into that). After attending each Walk during my first year of medical school, I became the chapter leader of GCSOM's Walk with a Future Doc. I have passed on those responsibilities to the new chapter leader, who I know will be that outside force for new students. I now serve as the Vice President of the National Student Advisory Board for Walk with a Future Doc's parent organization, Walk with a Doc. At a time in my life when classes felt like they were pushing me to my limits and COVID was an outside force slowing me down, Walk with a Future Doc was the outside force I needed to keep me moving. And, just as Newton's first law predicts, I don't plan on stopping anytime soon." -Emily Grimes

"Transitioning into medical school is a large hurdle every medical student must face. Between studying for exams, preparing for anatomy lab, working with community partners, and trying to maintain healthy habits, it is easy to forget that there are so many other things going on around us in the community. Walk With a Future Doc has been a way for me to pause and reconsider how important and simple it is to connect with the people that live around us. A simple concept of planning a short health talk and quick walk at the Lackawanna Heritage trail on a Saturday morning has been just as impactful for me as it has been for the community members. Being able to promote physical activity and social wellness is a great way to improve the skills necessary to build trust with future patients. I get to spend the time learning about the lives of those who live in Scranton. Hearing these stories is so inspiring and shows how many different factors can affect our patients and their health.

I started getting involved in Walk with a Future Doc this past spring and was immediately hooked. I enjoyed starting my day off with a refreshing walk in the park chatting with community members over all sorts of topics. From discussions on health and medical school to stories about friends and family, the hour flew by. I have big shoes to fill as the new chapter leader, since Emily has taken so much initiative and has played such a large role in making this program successful. I hope to use this program to further integrate GCSOM into the local community, have various organizations from the school become involved, and possibly expand our reach beyond the Scranton area. Many students at the school are eager to take initiative and use this program to improve the local community. We have collaborated with the Pokémon Go club to raise awareness for childhood obesity, the Outdoor Adventure Club has shared valuable resources with community members regarding wildlife and outdoor protection, and Primary Care Progress has gotten involved by sharing information regarding the Women's Resource Center. These are only a few examples of how a simple walk in the park has expanded thanks to the support of the GCSOM community. The community members who attend the walks greatly appreciate the support of the medical students and faculty, and I look forward to what this year has to offer our program." -Noah Hoffman

Geisinger Commonwealth's chapter of Walk with a Future Doc meets every fourth Saturday at the Heritage Trail Pavilion at 9:00 AM. Noah Hoffman can be reached at nhoffman@som.geisinger.edu if you have any questions, would like more information on the GCSOM chapter, or if you would like more information on Walk with a Future Doc or Walk with a Doc.

IN THE GCSOM COMMUNITY

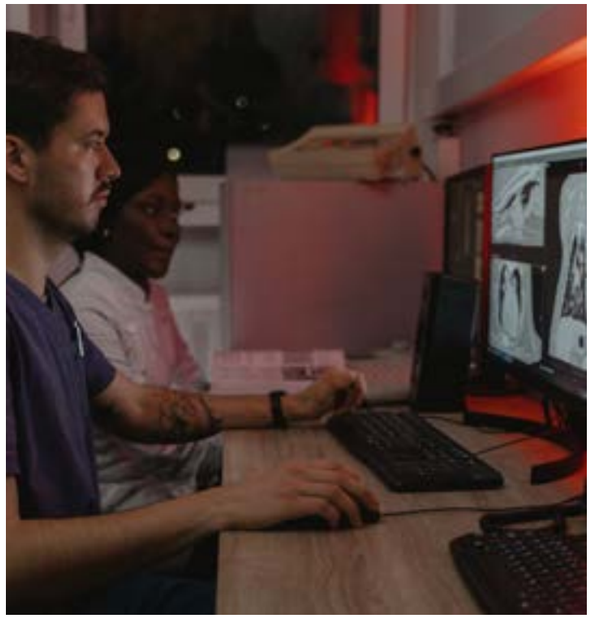
NIKI VIRADIA

Osteoporosis is one of the most prevalent musculoskeletal issues that affects the world population and Jessica Koshinski and Stephan Aynaszyan are two M3 students from GCSOM who are trying to tackle it head on. Jessica and Stephan, who are both interested in orthopedic surgery for their potential residencies, used their cumulative backgrounds and interests to create HiROC (High Risk Osteoporosis Fracture) Student Liaison Service alongside the existing osteoporosis clinic at the Geisinger Community Medical Center. HiROC is a program that aims to treat and educate patients that experience low impact fragility fractures. The goal of HiROC is to improve patient health literacy through education and stressing the importance of follow-up care for osteoporosis patients and will use students from both the medical school and MBS program to achieve this.

As medical students, Jessica and Stephan noticed a need to improve the current education that exists on bone health in the local community. They plan to integrate their liaison service into work directly with the HiROC clinic along with the physicians at GCMC. "We thought those pieces would allow for a model that enabled students to provide physician-guided education to patients that experienced a fragility fracture, with the goal of increasing patient follow-up and improving outcomes," Koshinski said.

With the launch of the service, they hope to improve patient engagement in osteoporosis care at Geisinger and have their fellow students utilize the unique opportunity to connect with patients, learn from their stories, and help educate the impact of their care as well. Participating student volunteers will be conducting surveys and follow up calls with patients to provide educational resources, listen to and address concerns that need to be relayed to the healthcare team, and monitor compliance as well. "We also hope this provides practical lessons to students about patient engagement with health care, the social determinants of health, and exposure to the teamwork that is an essential part of a career in medicine," Koshinski emphasized.

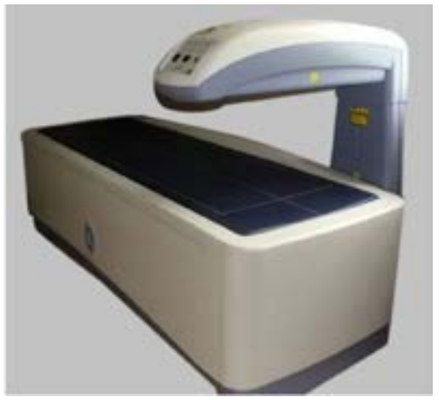
Koshinski and Aynsazyan are truly pioneering the way forward in osteoporosis education in the Geisinger community, and hope that they may set a national standard for other medical schools and students to follow in the future.



A REVIEW OF DEXA SCAN BODY COMPOSITION ASSESSMENT IN PEDIATRIC POPULATIONS

CHRISTOPHER RENNIE & NICOLE LICIAGA SILVA

An objective measurement of overall health is difficult to obtain, simply due to the sheer complexity of the human body and the intricacies surrounding metabolism, disease states, and aging. One major area of focus that plays into well-being is related to our physical activity and habitus, such as fat distribution, bone density, and muscle mass makeup. In 1987, the Dual-Energy X-ray Absorptiometry (DEXA) scanners were introduced to the field of medicine, and with this, we gained the possibility to accurately, objectively, and safely gauge the state of our health through the lens of body composition. (1)



DEXA scans were originally intended for the use of bone density analysis and osteoporosis screening, however, it is now regularly employed for comprehensive body composition measurements. (1,2,3) DEXA works via low-energy and low-emission X-rays through the various tissues in the human body, registering attenuation, density, and R values depending on the composition of soft tissue. (2) In an oversimplification, these measurements are then transcribed and colored into a report that essentially allows visualization of fat, muscle, and bone comparison in both single regions as well as throughout the entire body. (2,3) The purpose of this review is to summarize the most recent and current literature surrounding DEXA scan utility for our pediatric populations as it relates to dietary behaviors, growth patterns, deficiencies, sex-related comparisons, metabolism, and disease states.

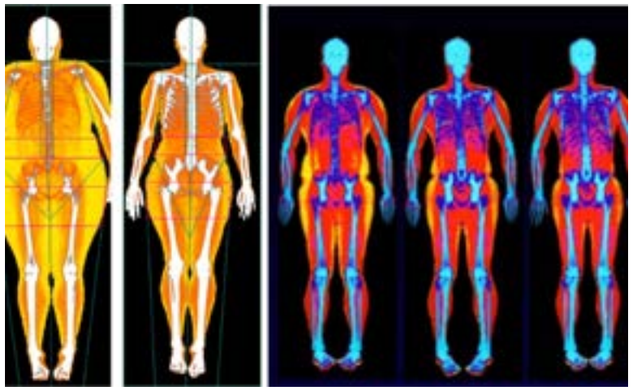
It seems to be a generally accepted rule in society that children must eat well and be active in order to "grow big and strong." Until recently, this notion has not been supported with the same level of data as the importance of nutrition and physical activity in the elderly for example. A recent study utilizing DEXA technology found a statistically significant positive correlation between exercise and increased skeletal muscle mass among 640 adolescent participants. This same study also analyzed the adverse nutritional contribution between sugary beverages such as sodas and the inability to add skeletal muscle mass through exercise. (4)

Several prospective studies have further focused on specific parameters and activities within adolescence as opposed to purely observational research. One project in Japan studied 340 children aged 6-12 through a regimen of at least 60 minutes of exercise 5 days per week and performed muscle strength and muscle mass analyses. (5) Another study investigated the body habitus of 172 post-pubertal adolescents with the comparison and connection between bone mass, bone density, and muscle strength in males and females. (6) A meta-analysis examined the musculoskeletal adaptations in young girls who participated in gymnastics compared to non-gymnasts. (7) Each of these studies found a positive correlation between activity, muscle mass, muscle strength, and bone density, recommending a highly active lifestyle to be critical for pediatric development.

> "RECOMMENDING A HIGHLY ACTIVE LIFESTYLE TO BE CRITICAL FOR PEDIATRIC DEVELOPMENT."

Beyond the general developmental trends of children, physical activity, muscle mass, and body composition monitoring are becoming increasingly beneficial for predicting long-term health outcomes. Relatively new data suggests that muscle mass and body composition during adolescence not only plays a role in neurocognitive development as a child, but also in the pathophysiology of numerous conditions in adulthood such as osteoporosis and sarcopenia. (8,9) Identification of these tendencies before irreparable damage has occurred throughout development is critical. This holds true for conditions like diabetes as well, as studies have revealed a connection between low skeletal muscle mass and both higher rates of metabolic conditions and lower age of onset. (10)

In each of the studies highlighted above, the consensus remains that pediatric development is highly dependent on proper body composition. The overarching recommendation is the necessity for physical activity in order to maintain optimal skeletal muscle mass, fat distribution, and bone health. A commonality shared between each of these studies was the use of DEXA scans to achieve these results. DEXA scans are currently expensive and can only be performed up to twice a year to limit unnecessary radiation and reduce the possibility of cancer formation. Ultimately, the millisieverts (mSv) are relatively low compared to other imaging modalities and the increase in use has proven to be more beneficial than not as seen here. (11) These studies were once not possible in a safe and minimally-invasive manner, however, with the advent of DEXA technology, the future state of pediatric development and monitoring appears to be headed in the right direction.



THROUGH THE EYES OF AN INTERVENTIONAL RADIOLOGIST

NIKI VIRADIA

Interventional radiology (IR) is a subspecialty within radiology that is finding new legs in the musculoskeletal world. Traditionally, IR is used to treat and diagnose a wide range of conditions by relying heavily on computed tomography scans (CTs) and ultrasounds to help guide their procedures while inserting various small tools, such as catheters, into the patient. Some common procedures that IR can tackle include angiographies, embolizations, stent placements, needle biopsies, and exploratory vascular procedures. In some cases, the use of IR procedures can eliminate the need for hospitalization altogether, which is regarded as a great benefit to some patients. As the medical world continues to evolve and overlap, IR is also seeking to expand its procedures by dipping into other specialties, including orthopedics, by using IR techniques in elective MSK surgeries. While a relatively new expansion, IR has become another option for certain types of patients that may not be the best candidates for traditional surgical repairs.

Dr. Neal Viradia is an attending and assistant professor of Interventional Radiology at the Miami VA Medical Center who has been practicing for over 5 years. As an IR attending, Dr. Viradia sees and treats athletes who have worn out some of their joints or have MSK related issues that require interventional treatments that go beyond physical therapy and generalized surgery. He spoke on his specialty stating, "Interventional radiology crosses over quite a bit with orthopedic healthcare. We see a lot of patients with MSK pains and could be a great alternative specialty for medical students interested in orthopedics."

Dr. Viradia and his team perform genicular artery embolizations (GAEs) as an innovative treatment one option for certain patients presenting with inflammation due to osteoarthritis and degenerative ACL injuries. Patients who qualify for GAEs may be elderly, unable to withstand traditional surgeries, or have tried at least one other treatment option like physical therapy or NSAIDS. Dr. Viradia believes that "GAEs could be the future of osteoarthritis procedural treatments. It makes life and recovery a lot easier on the patients, generally." Genicular arterial embolizations are performed as an alternative to total replacement surger

-ies and are considered to be much less invasive as well, cutting the recovery time for patients significantly. Compared to historical replacement surgeries, it was found that GAEs significantly reduced the pain index felt by osteoarthritis patients and even resulted in a decline in opioid, NSAID, and intra-articular hyaluronic acid medication usage (1). Dr. Viradia also performs another type of transcatheter arterial embolizations for neovascularization and other joint pains as well.

These procedures may seem novel now, however, they could become more commonplace as the field of interventional radiology continues to evolve alongside its orthopedic counterparts. By including aspects of vascular treatments and pain management, orthopedic physicians could potentially work alongside these specialized radiologists to create a seamless and less debilitating path forward for patients who need alternatives to traditional surgeries. While the short-term benefits seem to be the minimization of inpatient admittance and easier recoveries, the long-term benefits of IR are still relatively unknown. The field will continue to grow, and the procedures will also, undoubtedly, become more refined and specialized. Dr. Viradia and his team are excited to be a part of this cutting-edge expansion of medicine reporting that, "The field has already changed so much from when I began my career as a resident, and I am looking forward to seeing how it continues to evolve in the future."

REVIEW OF "CARE OF THE ACTIVE FEMALE"

MAYA GLANDER

In its July issue, the American Family Physician published the article "Care of the Active Female" written by Katherine Wojnowich, MD and Rachel Dhani, MD. This article identifies exercise recommendations, but heavily emphasizes specific injury risk factors, relative every deficiency in sport (RED-S), and the Return-to-Play model. Thus, this review will focus on the latter two topics.

In general, female athletes have a higher incidence of overuse injuries than acute musculoskeletal injuries. Common overuse injuries include iliotibial (IT) band syndrome, patellofemoral pain syndrome, and stress fractures. The classic presentation and recommended treatment protocols are tabulated below (Table 1). Regarding acute injuries, the narrower femoral notch and smaller ACL predisposes female athletes to anterior cruciate ligament (ACL) tears. Fortunately, multiple studies demonstrate targeted leg exercises (hamstring-focused strengthening, lunges, heel-calf raises) and exercises focused on landing mechanics (jump and hold) are effective in preventing ACL tears even up to 50%.

Table 1: Common Overuse Injury Presentation and Treatment

Overuse Injury	Pain Presentation	Common History Findings	Recommendations
IT band syndrome	Lateral knee	High mileage running	Active rest, stretching, hip adductor strengthening
Patellofemoral pain syndrome	Poorly localized, anterior knee, aggravated by stairs, kneeling	Running, squatting	Physical therapy, posterior hip & quadriceps focused
Stress fractures	Localized, aggravated with activity	Increase in activity level	Relative rest, moderated weight bearing

RED-S is a possibility in any active patient and denotes an "imbalance between caloric intake and expenditure." In RED-S, the "expenditure" is a specific sport or exercise regimen. Energy deficiency can impair normal bodily function, decreasing concentration, endurance, and ability to heal. Common presentations of RED-S include amenorrhea/oligomenorrhea, low body fat, recurrent injuries, and increased fatigue. Based on symptoms present, the patient can be assigned to the low, moderate, or high-risk category. The Return-to-Play Model then makes recommendations based on the calculated risk. Follow-up is recommended every 1 – 3 months and findings indicative of improvement include decreased fatigue, return of/more regular menstrual period, and weight gain.

Table 2: RED-S Risk Stratification and Return-to-Play Model

	Low Risk	Moderate Risk	High Risk
Plan	Follow-up	Meal plan, individualized weight gains Regular follow-up	Detailed & highly monitored meal plan, individualized weight gains Regular follow-up
Activity	Full return	*Partial* return (i.e., can train, cannot compete)	Restricted (until certain goals met)

Overall, this article provides an overview of the risk factors associated with common injuries in female athletes. It also highlights the importance of RED-S and its treatment recommendations. After all, a sports physical is not just another document to sign. It is our duty as physicians to care for our patients, identify harmful disease processes, and work with our patients so they may enjoy life both inside and outside of sport.

CHASING THE HEAT

EDWARD LIU

It was a typical morning amidst the bright summer day of New York City (NYC) in July. As my alarm clock rang at 6:30 AM, a surge of shockwaves struck me as I felt overwhelmed for what was going to be another hectic day at the renowned Memorial Sloan Kettering Cancer Center (MSKCC). Leaping out of bed, my leg muscles felt like they were on fire from the constant standing and walking the day before. I mustered up the courage to get ready for the day ahead.

As I arrived at MSKCC, I felt my gut wrenching that my workout routine would become more challenging. From pushing through boulders to absorbing waves of criticisms, I knew I must continue to learn more about the perioperative setting and grow thicker skin by continuously receiving constructive feedback on medical etiquette from my mentor, an anesthesiologist. Putting on my scrubs and skull cap, I followed my mentor into the operating room to watch her sedate the patient before the operation. The traffic was well-observed in the room: the various complex tools, protocols, and individuals in the room gravitated me towards the busy scenery. However, I quickly realized that as an observer, I was only able to stand on the sidelines, where I spent most of my time interacting with the certified registered nurse anesthetists (CRNAs) and watching the operation through the monitors. As I watch the patient's vitals, hemodynamics, and sedation levels, the CRNA would administer anesthetics and analgesics accordingly to keep the patient unconscious. I also acknowledged the crucial role the anesthesia team plays in helping patients survive the surgical ordeal.

As the minutes flew by, my body urged me to move into the "combat zone" where I would have to scrub in to witness the procedure at a proximity. As I scrubbed in for the first time, I froze in shock, as shivers went down my spine. I was in awe that I was watching an alive human being operated on in real-time. The precise excisions made to remove the tumor, fat, and other parts being removed felt so surreal. As the procedure started to end, my legs almost gave out from standing for what it felt like eternity. However, I knew I had to keep my blood flowing since there is still much more to see and learn.

When the surgery was finally completed, I followed the nurses to the post-anesthesia care unit (PACU), where the patient recovered. Just when my legs begged me to stop moving, my mentor informed me to go to join the anesthesia pain management team. Dragging my feet to the pain unit, I eventually arrived at the department, where my eyes immediately shifted to the group of fellows and physicians who were excited to see me. Thanks to their guidance, I learned much about the different types of nerve blocks, including spinal, epidural, and transversus abdominis plane blocks. Being educated by these knowledgeable professionals was one aspect, but what was more important was witnessing the kindness and care that they emitted and their thorough work efforts. As the smiles of patients radiated throughout the floor, I quickly acknowledged how providers at MSKCC live up to their name.

In the blink of an eye, my day at the hospital was coming to a halt. After saying farewell to the pain team, I reported back to my mentor and explained to them my day's experience, while receiving constructive feedback on how I can improve my body language, communication, and behavior at the hospital. Although my muscles felt like they were on fire after moving around and standing all day, I quickly used that fire to fuel my skin to absorb every inch of critique to my advantage so that I could be better prepared for the challenges I will face throughout my medical journey.

> "I QUICKLY USED THAT FIRE TO FUEL MY SKIN TO ABSORB EVERY INCH OF CRITIQUE"

After thanking my mentor for their comments, I dressed up and started heading back home. Stepping out of the hospital, a puff of hot air struck me and quickly my clothes became soaked with sweat. Despite the scorching heat, I made a strong effort to tug my heavy legs back home, especially after a whole day's "work out." Upon arriving home, I immediately sprinted to my couch, where my body thanked me for releasing it.

As I sat there, I contemplated deeply on the day. I enjoyed learning about the work of anesthesiologist and surgeons, the perioperative workflow, the team dynamic, and medical etiquette at MSKCC. As the night falls, the heat in my heart rises as I hope to further my education at the institution. I look forward to the curtain rising to get my next daily dose of workout walking through the summer heat of NYC, interacting with the various amazing healthcare professionals, and passing through the different rooms and halls at the hospital to continue fueling my passion for medicine.

DR. MICHAEL PHEASANT: THE BENEFITS OF BEING A TRAILBLAZER

SETH ELLISON

Would you opt for the path of stability, tradition, and established culture? Or are you motivated by the opportunity to create a path for others to follow? For Dr. Michael Pheasant, a recent graduate of Geisinger Commonwealth School of Medicine, the obvious choice is the latter. This past July, Dr. Pheasant and three other medical school graduates became Geisinger Orthopaedic Surgery Northeast's first class of residents.

This is not the first time that Dr. Pheasant has made the decision to lead the way on a major initiative at an educational institution. In high school, he was recruited to play for Misericordia University's first football team. While he had other offers to play college ball, Dr. Pheasant was intrigued by the chance to be a part of building a college's football program from the ground up. He viewed it as an opportunity for the inaugural team to set the bar for the program and the subsequent classes that would play for the school.

Dr. Pheasant also served as the president of the student body and consequently became an ambassador for the football team, leading the student government and representing his teammates to the school administrators and board of trustees. One of the biggest challenges the new football program faced was winning over those who had been skeptical of the launch of the team and the effect it could have on the university's community. Together, with his teammates and coaches, Dr. Pheasant demonstrated the positive impact the program would have and continues to have on the university's community. "We worked closely with the board of trustees and the school administration to represent the program well and help build, not only the football program, but also, the campus community around us," Dr. Pheasant stated. Several previous skeptics of the football program thanked Dr. Pheasant and his teammates for representing the university so well and strengthening the overall culture of the university. These words of gratitude still resonate with him today.

Building something from scratch is never easy. Fortunately, Geisinger's Orthopaedic Surgery Northeast program will not need to reinvent the wheel. The Central location's well-respected orthopaedic residency program in Danville provides an established, successful model to follow. Still, the Northeast program will stand on its own. This means that the culture of the Northeast residency program will need to be created, in part, by their first few classes of residents. The opportunity to help establish that culture was of particular interest to Dr. Pheasant, and this is what initially intrigued him when he began to hear rumors during medical school of an orthopaedic residency program being established at Geisinger's Northeast campus.

> "THE CULTURE OF THE NORTHEAST RESIDENCY PROGRAM WILL NEED TO BE CREATED, IN PART, BY THEIR FIRST FEW CLASSES OF RESIDENTS"

Dr. Pheasant's goal was to be accepted into an orthopaedic residency. He would have been thrilled to match anywhere. However, the more he learned about the opportunities that the new Northeast program would provide, the more he made it his goal to match at the new program. "I am extremely humbled to have matched into orthopaedic surgery," Dr. Pheasant stated. "I get excited every day that not only am I on the path to becoming an orthopaedic surgeon, but I am also honored with the opportunity to be one of the many helping to build this program throughout my training."

Since starting residency just over a month ago, Dr. Pheasant is very pleased with landing at his top ranked choice. Having rotated with the faculty, he knew that the educational aspect would be excellent. Additionally, given the fact that Dr. Pheasant and his classmates are currently the only orthopaedic residents in the program, they all get early operative opportunities for very hands-on training despite being first year residents. Lastly, he looks forward to welcoming the next and subsequent classes of residents and working with them to build a culture of excellence, collegiality, and teamwork.

INAUGURAL NORTHEAST ORTHOPAEDICS RESIDENCY PROGRAM

Dr. Danielle K. Skrzypek
Hometown: Bristol, CT
Undergrad: University of Massachusetts Amherst
Medical School: University of Connecticut
Why did you choose orthopaedics? I chose orthopaedics because of my love for problem solving and helping patients get back to their previous level of function in their daily lives.
Fun Fact about yourself: In the past 4 years, I have been to 10 international countries!

Dr. Anna Hayward
Hometown: Jacksonville, FL
Undergraduate: Florida State University
Medical School: Florida State University
Favorite surgery: Primary knee arthroplasty
Why did you choose orthopaedics? I love orthopedics because I'm a hands on person. I love to tinker and orthopedics allows me similar opportunity to problem solve and create. As an active person, I understand the severe impact musculoskeletal injuries can have on your life and I'm honored to be able to help people heal and get back to the active life they want to be living!
Fun fact about yourself: I love to travel. Everywhere I travel, I get a keychain and nail it to a map I painted. My favorite place is Peru. I have a golden retriever named Elton John and a cat named Kitty.

Dr. Michael Pheasant
Hometown: East Stroudsburg, PA / Dunmore, PA
Undergrad: Misericordia University
Medical School: Geisinger Commonwealth School of Medicine
Why did you choose orthopaedics? Orthopaedic Surgery appealed to me as an outstanding opportunity to combine technical skill, ingenuity and even creativity with a genuine concern and care for people. Above all I was attracted to the unique opportunity and privilege of helping to restore the human body to full function and allowing patients to achieve the full physical potential they were created to achieve.
Fun Fact about yourself: I enjoy cooking, and spending time outdoors, hunting and fishing.

Dr. Alex Tang
Hometown: Brooklyn, New York
Undergrad: The City College New York, Sophie Davis Biomedical Education Program
Medical School: CUNY School of Medicine
Why did you choose orthopaedics?
I developed a late interest in orthopaedics during the middle of my third-year rotations after seeing a patient with disabling hip arthritis dependent on her walker, walking pain free after just a few months following her hip replacement. From her experience, I realized the impact that orthopaedic surgery had on improving our patient's quality of life, minimizing pain, and restoring function. This led me to taking an additional year of research, which not only solidified my interest, but also sparked my passion for clinical research, education, and providing quality musculoskeletal care, which I intend to continue as a resident here at Geisinger.
Fun Fact about yourself: I went shark cage diving last summer in Hawaii surrounded by Galapagos sharks and lived to tell the tale.

EXERCISE AS "JOYFUL MOVEMENT"

CEILIA SEVERINI

Exercise is one of the most important things we can do for our bodies, and it can be one of the most enjoyable, too. However, "exercise" does not always sound enjoyable as a term. Exercise, as defined by Merriam-Webster Dictionary, is "bodily for the sake of developing and maintaining physical fitness." I spoke with two PGY-3 resident psychiatrists from the Wright Center for Graduate Medical Education in Scranton, Pennsylvania, about prescribing "joyful movement" as a treatment for their patients, and how using that term makes a difference in following through with treatment.

Dr. Erica Schmidt is originally from Hollidaysburg, Pennsylvania, attended undergraduate school at the University of Wisconsin-Madison, and graduated from Trinity School of Medicine. She uses the term "joyful movement" when talking about exercise or physical activity with her patients. Dr. Schmidt explains that patients often come to the clinic worried about weight gain on top of the main reason they have an appointment. She often tells patients to eat three meals a day, have snacks, and to strive to make their plates "more colorful." She is an advocate against restricting food arguing that often harms metabolism. Dr. Schmidt prescribes "joyful movement" to all patients and leaves it up to the patients to decide what that means for them. "Some of my patients enjoy hula-hooping, roller-skating, and dancing. Doctors often recommend 150 minutes a week, but it's not realistic for most of them to be on a strict exercise regimen at this point," she said.

Dr. Noha Hafez is originally from Egypt, attended medical school there, and moved to the United States for residency. She echoes Dr. Schmidt's points about joyful movement and allowing the patients to decide what that means to them, and what kind of joyful movement bests fits into their schedules and lifestyles. She adds that, "the main goal is not weight loss, but improvement of mood. Any kind of physical activity gets the patient out of being preoccupied with thoughts, and improves mood, anxiety, and depression."

A technique Dr. Hafez uses when talking to her patients is known as "motivational interviewing," which allows the change of adding movement to their lives to come from within the patient instead of from her. If patients want to make the change on their own, they are more likely to follow through and find an activity that fits their schedules and allows them to be consistent.

Because movement is helpful for all patients, these physicians prescribe it across the board to patients who come into the clinic. In inpatient units, they are less likely to prescribe exercise because patients are not at the right point in their mental health journey for this intervention. Dr. Hafez pointed out that they do need to be careful when talking about exercise with those patients with eating disorders. Therefore, she tends to focus on the non-physical benefits with those patients.

Exercise, or "joyful movement," is a great activity for anyone feeling stress or struggling with mental illness. However, Dr. Hafez reminded me that medications are still important for her patients. She explained that sometimes patients will say lifestyle modifications, such as diet and exercise, should be enough to help them. Dr. Hafez stated that "medications are superior and a necessity, and lifestyle changes do not substitute them." Medications will often give those struggling with depression or other mental illnesses the energy to be motivated to joyfully move and engage with life. Therefore, joyful movement and medication go hand in hand in treating those with mental illness, and these forms of treatment together have better health outcomes.

READING ACADEMIC LITERATURE

Frank Vazquez

JBJS recently released an article titled "Biomechanical and Finite-Element Analysis of Femoral Pin-Site Fractures Following Navigation- Assisted Total Knee Arthroplasty," which at first glance seems like an intimidating title. Medical jargon can often be opaque, especially to the layman but sometimes even to those who have read many papers. Developing a method to dissecting academic papers is an essential skill to anyone pursuing medicine or any field where evidence-based practice is the standard. This is a skill we will work through and develop together by going through all the steps necessary to understand this article. The goal is to develop skills that are generalizable to all articles in hopes that you can walk away from reading this having a better understanding of how to approach a particularly dense piece of academic writing.

> **DISSECTING ACADEMIC PAPERS IS AN ESSENTIAL SKILL TO ANYONE PURSUING MEDICINE**

So how could we possibly begin to understand what "finite-element analysis" even means?? When in doubt, the title is a great place to begin as it typically gives a succinct idea of what the research is about, while also introducing easy to search up terms that you may not know the definition of. A quick search of "finite element analysis" reveals that it is a method for determining the physical forces acting on an object, typically using computer algorithms. Biomechanics is the study of the physics of biological systems. Searching up femoral pin-site fractures tells us that these are fractures that occur where a pin may have been placed after a previous surgery. Why do these subjects have femoral pin site fractures? The answer is revealed by searching up the next term, "navigation-assisted total knee arthroplasty," which shows us that it is when you replace the tibial and femoral surface of the knee. Sometimes, depending on your background, you may have to go down a rabbit hole of search terms. For example, if you did not know what a tibia was, you would search that up to find out that it is one of the lower leg bones. Once you've broken down all the terms, it is important to contextualize all of them. For example, now that we know what a navigation assisted total knee arthroplasty is, it is now clear that the pins involved in the pin site fractures of these patients come from the arthroplasty.

Now that we have a basic understanding of the elements of the study, it's time to understand what is being studied and tested specifically. If more time needs to be taken to understand the basics, the background or intro sections typically have a part of it dedicated to teaching new readers about the elements involved. For the actual study design, a first look at the abstract gives a good quick idea of what the methods and results look like. This will not go into the finer detail, and as a result, may either lack the depth you need, or can be hard to read without the other relevant details to the study. The abstract in this case reveals that it is a study on the biomechanics of rabbit femora. Femora in this case refers to the bone analogous to the femur in humans (the thigh bone). The study abstract describes that the biomechanical strength is measured with three different measurements, torsional force, 3-point bending, and axial compression, all of which measure the force until failure. These three aspects seem to be compared with a femora that has been drilled into, however we get no grasp of how many experimental groups there are, if there is a control group, or the method used to drill into the femora. This demonstrates the limitations on relying solely on the abstract. Without knowing these methods, it is impossible to tell the strength of the evidence in the study.

Now that we are onto the paper itself, one of the important things to take note of is how terms are defined, and if any acronyms are used. If a long phrase is used commonly in the paper, it will usually be shortened in its first instance of use. This allows for more concise reading, but can also leave the reader confused if this part is skipped over. The way that acronyms are denoted is by parenthesis on the first instance of use. For example, in this paper, the first time "finite-element analysis" is used, you can find "(FEA)" right after, which means every time you see "FEA" in the paper from now on, know that it stands for "finite-element analysis." For definitions, it is important to know what criteria the researchers set out for what "failure" means in this instance. This is important because failure could mean that the femora breaks, or it could mean significant displacement bone shape. In this instance, the methods contain a sentence saying, "The failure load and failure displacement were derived from the load-displacement curves, which typically exhibited a pronounced peak near the end of the curve." In this instance, it was not outright worded "the definition of failure in this experiment is" but rather they used the word "derived" to indicate how the failure points were found. For this study, it is not a physical observation of failure of the material, but rather a mathematical point where the curve of a graph demonstrates a peak.

Now that definitions and acronyms are in order, we can truly start to understand the study design. This is usually very well summarized in the methods section of papers. This study split 75 rabbit femora into 5 randomly assigned groups. One group was the control with no drilling, while the rest had increasing levels of what is known as "drilling eccentricity." This is where our prior skill of searching terms helps us, revealing that drilling eccentricity is related to the angle of entry for the drill. It is important to note that the reader should always be searching up unknown terms throughout their reading of the text.

The final piece to understand is the results. Now that we know the experimental design, we can see if, in this specific instance, the variable of the drilling method affected the biomechanical strength of a bone. This is where it may diverge depending on familiarity with the topic. If you know your stats and are familiar with the topic you are reading, there is a lot of information to be gained from the results section. However, if you need an explanation of these numbers in writing, the discussion and conclusion would probably offer more information, albeit at the detriment of truly understanding the numbers. In this case, it seems that eccentricity had a positive correlation with material failure. This means that the more of an angle that the drill approached in, the more likely it was that smaller forces would lead to failure. This was most apparent with torsional forces, but all types of forces followed this positive pattern.

> **WE TOOK A SCARY LOOKING TITLE AND DISSECTED IT TO BETTER UNDERSTAND THIS STUDY**

We just took a scary looking title and dissected it to its component parts to better understand this study. The great thing is that this method can be generalized and used for most studies to understand. Becoming a health professional means honing your skills in academic literacy as a tool to become a better practitioner. I hope this serves as a useful guide for future health professionals working with the musculoskeletal system.

ATHLETIC TRAINERS IN THE ORTHOPAEDIC CLINIC

DELANEY TYL, ATC, LAT

Traditionally athletic trainers have been thought of as many things except for clinicians in orthopedics. We are often referred to as personal trainers, nurses, or "hydration specialists," and are primarily noticed when running onto the field to tend to an athlete's injury.

To clarify, an athletic trainer is a certified and licensed healthcare professional who specializes in sports medicine, including orthopedic evaluation, diagnosis, and rehabilitation. Athletic trainers treat a range of patients and can work in a variety of settings. The most traditional setting being high school, collegiate, and professional athletics. Over the past 15-20 years, we have been branching out into the orthopedic clinic setting. It has been difficult to gain recognition in this field when working side by side with more high-profile healthcare professionals like orthopedic surgeons and physician assistants. Nonetheless, an athletic trainer's skillset is the missing piece we did not even know was missing.

The path to becoming an athletic trainer consists of obtaining a bachelor's degree, followed by a master's in athletic training. This is where you gain the foundations of orthopedic evaluation, diagnosis, and treatment. As part of obtaining this degree, you are required to complete clinical rotations in a variety of settings where you obtain hands-on experience evaluating and treating actual patients. All of the skills and certifications obtained throughout this degree make an easy transition into the clinical setting. The ability to interview and interact with patients has already been mastered, the skills to perform an orthopedic exam have already been practiced, and the knowledge and ability to anticipate what treatment is expected after a diagnosis is already second nature.

Now, how does the athletic trainer help what some may consider to be an already smoothly running orthopedic clinic? Athletic trainers are now the first person the patient will see. They will obtain a more detailed and focused history than what the patient documents on intake forms. They will perform a physical exam, come up with possible diagnoses and differentials, and start considering possible treatment options. Next, the athletic trainer presents a summarized version of their findings to their physician. This provides the physician with more information and clarity before even seeing the patient and allows them to spend more time discussing treatment options and educating.

As previously stated, athletic trainers are healthcare professionals. Therefore, we can also educate the patient on a variety of topics. Some of these include how to use the brace or medication they were prescribed, how to perform the home exercise program they were given, and how to make activity modifications they may need in their daily lives to achieve the best outcome. We are here to help educate them and answer any questions that they may have after the physician leaves the room.

Recently athletic trainers have also gained a presence in the operating room, especially at ambulatory surgery centers (ASCs). Unlike large-scale, multimillion-dollar hospitals, many ASCs do not employ physical therapists due to cost. This has led to athletic trainers entering the ASCs for the patient's benefit. Some athletic trainers have even obtained specialty certifications and are able to assist their physicians during surgery. The athletic trainer then meets with the patient when they wake up and goes over detailed postoperative protocols and answers questions. Next, they get the patient up, walking, and completing therapeutic exercises as soon as possible before they leave the facility. At ASCs that do not employ athletic trainers, the process looks something like the following: the patient wakes up, they are provided with a packet of information and instructions to read on their own, and then they are discharged once stable. Many clinics have found improved compliance and better outcomes after surgery when an athletic trainer can go over postoperative instructions, bracing, and therapeutic exercises in more detail than the physician or ASC staff.

The last piece of the puzzle comes to continuity of care for athletes and patients. When patients call or email with questions for their physician, the athletic trainer can filter and triage these questions, and respond to patients in a more timely manner than the physicians given their busy schedules and volume of calls and emails. Also, many middle school, high school, collegiate, and pre-professional athletes may need to see an orthopedic surgeon at some point throughout their athletic career. These athletes most likely have an athletic trainer at their school or facility who needs to stay in the loop about their injury but may not be able to attend the appointment due to their commitment to care for athletes at the campus or facility. An athletic trainer in the clinic is a direct point of contact for the athletic trainer in the traditional setting. This line of communication establishes appropriate continuity of care between healthcare professionals. It avoids any chance of miscommunication between parent/athlete and athletic trainer and verifies that the physician's orders are correctly stated. This also ensures that each patient has the appropriate treatment outside of the clinic and that protocols are completely carried out to aid in optimal outcomes and recovery.

The use of athletic trainers has proven to be very beneficial in boosting clinic volume and revenue and optimizing patient outcomes in multiple orthopedic clinics across the United States (1). However, it is still not commonplace to find them in most orthopedic institutes. It is important to note that athletic trainers are not replacing medical assistants, orthopedic technicians, or physician assistants. They are an important, and quite seamless, addition to the team of healthcare professionals necessary to treat patients efficiently and ensure their best possible outcome.

PHYSICIAN SPOTLIGHT: DR. KENNETH L. KOURY

JEFFREY MUN

Dr. Kenneth L. Koury has always loved working with his hands. His passion for working with his hands and love for anatomy led him to realize early on that orthopaedics was his calling. He took a course called Sports Medicine in high school, in which he was introduced to topics on anatomy and athletic training. After garnering interest in these topics, he decided to pursue a Health and Exercise Science Major in college. His experiences in high school and college were impactful, and they led him to enroll in medical school to pursue his passion for musculoskeletal medicine.

Throughout Dr. Koury's time in orthopaedic surgery residency at Rutgers, the State University of New Jersey, he gained a deep interest in orthopaedic trauma and adult reconstruction. He decided to pursue a fellowship that involved both subspecialties. Dr. Koury enjoyed how deeply gratifying and fulfilling it was to help trauma patients get through a life-changing event. Furthermore, he loved how as an orthopaedic trauma surgeon, he had to know how to operate on the musculoskeletal anatomy of the whole body -- from the shoulder down to the wrist and from the pelvis down to the foot.

While looking for the place to start his practice as an attending, Dr. Koury believed Geisinger's academic setting would be an environment he would thrive in. He had considered his options for practice models after fellowship. He thought an academic setting would be a perfect fit for him, because he wanted to practice in an environment with an emphasis on teaching and less emphasis on monetary value. His strong passion for mentoring and teaching led him to take on significant leadership roles as both the Director of Orthopaedic Trauma and Program Director of the Geisinger Northeast Orthopaedic Residency Program.

When he is not in the operating room or clinic, Dr. Koury can be seen woodworking or landscaping his property. He enjoys building furniture, with his favorites being

bookshelves and old furniture restorations. He even chops his own wood from time to time. Dr. Koury also recently became a father and always looks forward to coming home to spend time with his family, especially for bath time with his son.

Dr. Koury continues to make a profound impact on the NEPA region, providing high quality orthopaedic trauma care and educating the future of orthopaedic surgery. He left with some words of advice for our medical student readers: "I would encourage students in the younger part of their medical school careers to get involved with the orthopaedic surgery faculty. I recommend you get in front of us to get exposure to clinic and the operation room. The reality is that orthopaedic surgery is a competitive specialty. Therefore, I think students with a home orthopaedic surgery program should take advantage of getting that exposure and face time. Also, you should obviously study hard to do well on your USMLE boards and clerkships. But I'm sort of assuming that everybody's going to do that. Everything I mentioned right now will make writing letters for you all that much better and personable."

COWBOY BOOTS IN THE OPERATING ROOM: A PHYSICIAN HIGHLIGHT OF DR. GRANT D. HOGUE

ANDRES SOMOZA & SAMUEL PAEK

Dr. Grant D. Hogue hails from Powder Springs, Georgia, a semi-rural little town in Northwest Georgia just outside of Atlanta, where he completed his early education in the public schooling system and went on to Emory University for his undergraduate years. On his first day of classes, he met another young aspiring physician, Megan, who he married just after graduating. Together, they moved nearly 1000 miles away to San Antonio, Texas, where they started medical school at the University of Texas Health Science Center. After graduating in 2009, Dr. Hogue moved just a little further North to start his orthopedic surgery residency at the University of Texas Southwestern Medical Center in Dallas, Texas. While in Dallas, he spent time at the Texas Scottish Rite Hospital for Children, and it was that experience that ultimately confirmed his love for pediatric orthopedics. Unsurprisingly, Dr. Hogue was anointed as Chief Resident of his program. Soon thereafter, he moved back to the East Coast where he joined the team at the Boston Children's Hospital as a fellow in pediatric orthopedic and spinal deformity. Following this, Dr. Hogue found himself back in San Antonio where he eventually became the Division Chief of Pediatric Orthopedics and Dielmann Endowed Chair in pediatric orthopedics and spine deformity. After five years in this role, he picked up his cowboy boots and returned back to work at the Boston Children's Hospital.

Flashing back to medical school, Dr. Hogue noted that research was not a requirement to get into orthopedics, unlike now. "It was all about grades and away rotations," he explained. As a medical student, he did have one unpublished abstract, but after starting his residency the emphasis was on learning how to become a good orthopedic surgeon in just five years. Of course, being involved in 1-2 projects was still regarded as important in developing an understanding of research methodology, and it was his curiosity that drove this forward once he got into practice. "Whenever I had a question that I couldn't answer from reviewing the literature, I thought that 'maybe I could find it myself.' Slowly my curiosity took over," Dr. Hogue reported. Over time, this turned into a love for research.

Presently, Dr. Hogue's interests have guided him to exploring the intersection between marijuana use and pediatric bone healing. In a study published last year, he found that marijuana use slowed healing in pediatric fractures. A more recently published review paper explored this on a cellular level, finding that while THC might have inhibitory effects on bone healing, CBD may be protective. Dr. Hogue currently has three retrospective papers in the works, looking at marijuana use and outcomes in idiopathic scoliosis fusions, in periacetabular osteotomies, and in ACL reconstructions. He plans to release each of these as independent studies, with plans to acquire funding for future prospective works and animal studies.

Aside from his research endeavors, Dr. Hogue is also very involved in academics. "Lots of pediatric orthopedists are in academic medicine by default," he noted. He went on to explain that large pediatric hospitals often coexist with academic centers, so working at one went hand-in-hand with teaching at one. Nonetheless, his experiences made him want to be a part of education; that is, he wanted to be involved with the residents. This comes with challenges too, though. "The most difficult part of teaching is having a style with a broad appeal to different types of learners," Dr. Hogue explained.

Reflecting on this further, he added that it is about feeling out how to best teach someone and how to do it quickly, because time is limited, and he wants them to get the most out of their interactions. On the other side of this, he expressed that the reward of teaching is certainly worth the challenge. "To see the light come on after a resident attains mastery of a complex topic, that's instant gratification," Dr. Hogue said. "I'm doing it right, they're doing right, we accomplished something together."

Much of Dr. Hogue's love for academics stems from the guidance he received from his own mentors. In San Antonio, it was Dr. Kaye Wilkins. Per Dr. Hogue, Dr. Wilkins is "one of the greatest authorities on pediatric fractures in the world." For him, Dr. Wilkins emulated a particular type of leadership - he did not teach by showing his successes, but with his failures. When he went to Dr. Wilkins for advice on a particular patient, Dr. Wilkins would share one of his powerpoints showcasing what he did wrong so that Dr. Hogue could learn from his mistakes. "It's so humanizing, to lead with your failures," said Dr. Hogue. "Medicine is hard. Surgery is hard. We don't win all the time. The problems are really difficult. We're never going to put them back together completely, but we do our best to organize healing. So knowing that your heroes struggled, that they had suboptimal outcomes, and that they learned from them is very freeing. You can't be afraid to fail."

Dr. Hogue's experience with Dr. Wilkins was a driving force to return and start the first five years of his career at the University of Texas Long School of Medicine in San Antonio. A similar familiarity with the team at Boston Children's Hospital is what drove him to practice there today. Although, this was a difficult transition, as he started back in Boston on March 1, 2020 at the start of the pandemic. Moreover, he explained that he did not have the same freedom that he did as Division Chief in San Antonio, as he was now playing a smaller role as a part of a larger system. In the end, Dr. Hogue indicated that he would not change a thing. "I would do it all the same," said Dr. Hogue. "Not because I think I did it better or because I have all the answers, but because I'm satisfied with where I am and we're having a lot of fun. I can't imagine it being any better."

In his spare time, Dr. Hogue loves spending time with his family and chasing around his 9-year-old son. If he's not at home or in the hospital, you just might catch him at the golf course. Aside from that, he likes to watch mixed martial arts on TV (but not partaking in them). If you are wondering what Dr. Hogue would be doing if not medicine, here is what he said: "If I wasn't in medicine, the dream job would be to run the salary cap for an NBA franchise. I wouldn't want to be a general manager or the one who makes all the decisions. I would just want to crunch the numbers, but I have no background in finance whatsoever. I think it's incredibly interesting how teams bend over backwards to move draft picks and waive people and then sign and stash them to make their cap work out. Now you know what happens in my office at 4 AM."

For students interested in musculoskeletal health, Dr. Hogue shares some final words: "There are so many paths to taking care of people through the musculoskeletal system outside of just orthopedic surgery. Some people really like anatomy and how muscles work to make your legs move. There's rheumatology, PM&R, or even pathology. I think it's so cool how pathologists have the ability to look at these things on a microscopic level and give intricate and complex diagnoses that help guide surgeons in their approach to reconstruction." More specifically within the context of orthopedics, Dr. Hogue's impact on medical education continues to shine through his former students who are doing great work using the tools and skills that they honed under his guidance to help many children.

WHAT IS STRENGTH

ANDREW GEIL, BSAT

The National Strength and Conditioning Association defines strength as the ability to exert force under a given set of conditions defined by body position, body movement, which force is applied, movement type (isometric, concentric, eccentric, plyometric) and movement speed. This can also be simplified through Knuttgen and Kraemer's definition: "The maximal force a muscle or muscle group can generate at a specified velocity." (4)

Force is defined as mass times acceleration. The mass can be correlated to the weight being pushed or pulled and acceleration is related to our neurological system and its ability to properly time muscle contraction through specific muscle fibers to produce the maximal amount of force.

There are two primary variables when it comes to strength: neurological adaptation and muscle cross sectional area or the size of the muscle. Neurological adaptation is the learned patterns and behaviors our Central Nervous System (CNS) records and stores. Neurological adaptation is responsible for half of the equation of how we generate force, leading to strength. There are six primary ways neurological adaptation occurs in the CNS:

- Fiber recruitment
- Rate of firing
- Synchronization
- Contribution
- Reciprocal Inhibition
- Motor Learning

These adaptations occur through repeated exposure to movements (repetitions) and through changes in the variety of movement. Motor units are used to activate muscle fibers and consist of a motor neuron and the muscle fibers it innervates (activates). Each motor unit is stimulated by the CNS to start the muscle contraction processes using neurotransmitters.

During a bicep curl for example, the beginner lifter when first being introduced to this exercise will activate a vast number of random motor units to overcome this new unknown resistance. This is excellent for muscle hypertrophy where larger motor units will become active due to the new demand, but our neurological system at this time is inefficient where motor units are not in sync and will randomly activate in an attempt to complete the movement. In Olympic rowing events, there are up to eight individuals in one boat. When they work together in synchrony, they produce a much higher compounded force than when each individual pulls on their own out of sync. Each rower can be thought of as a motor unit and the paddles the muscle fibers that produce the movement. Over time, movements that are practiced become recorded by our nervous system where new neural pathways to different motor units will form. In essence the "rowers" or motor units will work as one to produce a much higher force. Our brains then begin to only activate the motor units needed to complete the movement in the most efficient, synchronized manner possible to conserve energy and effort. This leads to an increase in neurological efficiency that will improve strength and the ability to accelerate/produce force. At this point, the lifter can begin to increase the tolerance or resistance to the movement to further increase size and strength, based on a concept called the overload principle.

This concept of neurological adaptation is exceedingly important when it comes to post-operative orthopedic surgery. When there is damage to a muscle, the alpha motor neuron that innervates the muscle fibers rescinds to protect the body from further injury and often pain by inhibiting its contraction. When this occurs, atrophy of the muscle will occur due to the lack of innervation and results in decreased strength. When a muscle becomes inactive, the reciprocal muscle or other muscles that perform similar functions will begin to take over the job of the injured muscle. This can lead to three problems:

- Trigger point formation from increased acetylcholine in the neuromuscular junction causing tightness that will produce a pain response to the CNS
- Passive structures such as ligaments, bones, and connective tissue will become greatly stressed due to the inhibited muscle
- The reciprocal muscle will become overworked and fatigued leading to tendinopathy and disuse tendon dysfunction (2)

During surgery, cutting through structures such as muscle is unavoidable. This is why most surgeons will try to cut the muscle in the direction of the fibers, splitting rather than slicing. A posterior hip replacement or Total Hip Arthroplasty (THA) is an excellent example of dysfunction occurring in the gluteus maximus muscle following operation. Much of the rehab following a THA is focused on re-integrating those neural pathways re-activating the gluteus maximus needed for walking, sitting, standing, and most everyday living activities. After repeated bouts of exercise for the gluteus maximus muscle, the alpha motor neurons will track back to their location forming neural pathways that will strengthen the glutes overtime. Therefore, most surgeons now prefer an anterior approach where the gluteus maximus muscle is not involved and the rehab process is faster, along with other reasons as well.

When it comes to strength, it is not only about how much weight someone can lift, but at what speed, efficiency, and neurological activation involved. Take into consideration the amount of time it will take to develop strength from a neurological perspective and the repetitions needed to regain function and return to activities following an injury.

MEDITATING THE PAIN AWAY

JEFF LAKE

Prior to COVID-19 becoming a pandemic and outshining the remainder of medicine, Northeastern Pennsylvania (NEPA) was a hot spot in the opioid epidemic. One incidental finding of this epidemic was highlighting the number of people with chief complaints of musculoskeletal pain. This population, who has been dependent on these pharmaceutical therapeutics, requires alternative treatments. One such treatment, a modality of antiquity, is simply to meditate.

Improvements in technology and expanded research into the topic have brought meditation to the mainstream. It is now offered in specifically designed apps (e.g., Headspace), in at-home exercise programs (e.g., Peloton), and on music streaming services (e.g., Spotify). Essentially, it is hard to not have access to some form of meditation. Coupled with expanded access, research into meditation's medical applications, is a recipe for treating many patients quickly and easily.

In 2018, Harvard University conducted a study which sought to compare the effects of mindfulness and Cognitive Behavioral Therapy (CBT) on chronic low back pain. The study concluded mindfulness and CBT both provided improvement in symptoms, even at 26 weeks. Additionally, mindfulness was found to be just as effective as CBT, meaning both could be potential treatment options. In a 2019 study performed by the Wake Forrest School of Medicine, researchers found participants with higher levels of mindfulness also reported less sensitivity to pain. If the conclusions of these studies hold up, medicine gains two non-pharmacological modalities to combat pain.

> **"MEDICINE GAINS TWO NON-PHARMACOLOGICAL MODALITIES TO COMBAT PAIN"**

Meditation is simple: find a comfortable seat, notice the body and how it feels, feel your breath and its pattern, and gently guide thoughts back to these foci when the mind naturally wanders. It is simple, yet not quite easy. Meditation takes practice and the sense of ability waxes and wanes as some days will be more difficult to keep focused. Those are the moments when directing the mind back to the body and breath is most important.

With an aging population and increase in global stress, finding ways in which to treat these patient's pain is vital. Pharmacological options have proven to be difficult to navigate, risking abuse potential and copious side effects. Having non-pharmacological options, which are now being scientifically supported, carries fewer risk factors. Whether meditating for pleasure or pain relief, mindfulness activities can provide various health benefits, and can be in utilized all physician's plans of care.

THE ART OF DANCE: BEAUTY IN MOVEMENT

KHEVNA JOSHI

Before composing this article, I danced to one of my favorite garba songs for some inspiration about what to write. Garba is a special form of dance in the Hindu culture that originally came from the Indian state that I was born in: Gujarat. The dance is meant to symbolize and worship the feminine form of divinity. In Hinduism, it is traditionally believed that the divinity that resides inside of each person has feminine and masculine counterparts. To embrace the most complete version of ourselves that we can be, we should respect and develop both aspects of our inner personality. The purpose of the garba dance form is to rekindle the memory of our female persona and leverage that power to truly find ourselves.

I personally find it harder to write about the things in life that are more valuable to me, especially because these subjective experiences are much more difficult to put into words. So, what is dance to me? In a sentence, dance is a combination of my physical, mental, and spiritual energies that helps me to reach the ultimate zenith of my emotional expression. To expand upon that, whatever feelings I am harboring inside of myself, I find dance to be the most efficient, cathartic way of releasing those feelings into the environment and to whoever else is around me. As a medical aside, physical activity is a crucial component of the triad of lifestyle medicine, still not emphasized enough in the healthcare field. By engaging in adequate physical activity, you can prevent and slow the progression of countless disease processes, another significant advantage of dance.

When I dance, I feel liberated and energized. A feeling like none other, straight from the soul. It is not a temporary, superficial, surface-level happiness. Whenever I feel stressed or anxious, whether it be academically or socially, dance has always brought me back to the top of my spirits. It gives me a fulfilling sense of bliss, peace, and exuberance that I have not been able to adequately find in anything else.

At a young age, many Indian girls traditionally take classical dance lessons with a guru, another term for a respected teacher in the Hindu culture. As a girl who also took classical dance lessons here in the United States, I was always a very energetic child. I constantly jumped from couch to couch when I was young, escaping my parents' grasping hands as they tried to catch me while I ran around the house. I even used to choreograph dances on my own and perform them at small shows and in front of audiences who I knew well.

Eventually, I was inspired by my mother, also a well-versed Indian classical dancer, to finally take up dance classes with my esteemed guru. I immediately noticed a handful of girls in my class who did not seem like they had their heart in dance, because it showed in their expressions, grace, and movement that they were not dedicated. Whenever I danced, I would always put my whole heart into it, trying to efficiently synchronize these three important aspects. I realized that to become the best dancer you can be and to enjoy it while you are doing it, you need to have a passion for it – and this goes for anything that you do in life! Without passion, you will not be motivated enough to achieve your goals, and it will show in the outcome.

In 2015, I completed my Nritya Nipuna, or my arangetram, a 3-hour dance performance that marked the milestone of my 7 years of dance training. The dance forms that I performed included classical Bharatanatyam, Manipuri, folk, and fusion dance. The most memorable part was that every dance that I performed had a deeper, symbolic meaning behind it. For example, one of the dances was centered on Lord Shiva, known as the God of Destruction in the Hindu culture. The dance style was vigorous and forceful, with intense Tandav, the formal name for the dance of Lord Shiva. The strength and power of this dance embody the way that we should fight and overcome our inner demons, always crawling their way to the surface. Every day, there is a battle taking place inside of every person, between a white dog representing the purity and illumination of the self and a black dog representing the darkness of character. This dance reminds me to always strike down the black dog and continue struggling for the victory of the white dog through the practices of self-control, self-awareness, and self-awakening. Knowing that meaning allowed me to put that much more heart into my dance. That day, and now every time I dance, I felt like my dance opened a pathway directly into my soul and allowed me to experience just a taste of spiritual ecstasy.

The person who currently lives in the apartment on the floor beneath me probably becomes irritated, or at the very least confused, by all the banging noises that she must be hearing on her ceiling. A friend eventually told her that it was me dancing at 3 AM in the morning! This might lead some to believe that dance is my addiction. But addiction is such a negative word – I like to think of it as my meditation that transports me to a parallel universe by linking my external physical movements to my inner identity, the essence of who I am. It allows me to be more mindful of the present and forget about the worries of my past or anxieties about the future and to just live in the moment. By unfettering my energies through dance and focusing on the here and now, I have opened my mind and body to a new ocean of limitless possibilities.

SECRETS FROM A JUNIOR VOLUNTEER

ABRIL XU

As the sun refracts through the wall of glass windows, the swell of heat softens into HFAMs air conditioned calm. For six weeks, this had become my new norm. I would hitch a ride with my parents, speedwalk to the office to make it by 9, and then eat my eleven-dollar lunch in Atrium. All of this done while wearing a red-and-white pinstripe vest.

As a member of the newly re-launched Junior Volunteer Program, the past month and a half have been a waltz of exploration and information. It is designed specifically for high school students with indicated interest in the healthcare field. My fellow volunteers and I had a variety of aspirations, planning on specializing in everything from psychiatry to orthopedics. For most of us, being a JV - or candy striper - was our first introduction to a clinical setting.

Each week followed a similar schedule. After clocking in, my partner and I would be assigned to a specific unit. There were several that we rotated around at: Oral Surgery, Radiation Oncology, the Surgical Suite, a couple of patient floors, Supply Chain, and more. Each one was its own unique environment, with specific expectations and tasks:

The operating room welcomed us with sterile lights, scrubs and shoe covers, and trays of supplies to outdate.

On patient floors, we dodged the bustle of nurses to deliver waters and pick up soiled linens.

In Radiation Oncology, we stuck on envelope labels, restocked snacks, and flattened the vac-lock bags.

After walking through the dim lights and exposed pipes of the tunnel, we found the warehouse and mailroom of Supply Chain. While listening to country songs on the radio, we sorted through stacks upon stacks of returned emails.

When shifts ended early, volunteers would stand in the lobbies and give visitors directions as wayfinders, germ patrol with

gloves and CaviWipes, or rumble down hallways, pushing the Caring Cart. Each placement offered a new and valuable glimpse into Geisinger's innerworkings. I was especially interested in the network of internal zip codes, the journey of tools from Central Sterile to the operating table, and how to scrub in.

Coupled with the regular hours, there were options for education sessions. They were led by professionals in their specialties and ranged from neurosurgery to security to interventional radiology. Each speaker talked about their student-to-physician journey with digressions into taking cheek samples, petting Aria, and doing spinal screws.

Although I enjoyed every part of volunteering, I think my favorite aspect was realizing how much I grew over the summer. During the 60 hours I spent in the hospital, I figured out the system of elevators, walked around enough to give patrons directions, challenged my medical preconceptions, and - arguably the most important - learned what to order at Atrium.