



▲ Capt. Marlene DeMaio, MD, USN

Capt. Marlene DeMaio, MD, USN first fell in love with orthopaedics in medical school in the early 1980s. “It was like I’d died and gone to heaven,” she remembered.

As a student at Hahnemann University, now part of Drexel University College of Medicine, Capt. DeMaio was sent to Robert Packer Hospital in rural Pennsylvania. Despite warnings from her advisors that orthopaedics was considered a rough-and-tumble field, still an exceptional choice for women, Capt. DeMaio was accepted into the orthopaedics program at Yale School of Medicine and thrived.

Explained Capt. DeMaio, “My father, a pulmonologist, was initially hesitant, but he eventually saw the utility of the arthroscope over the bronchoscope!”

She said she also enjoyed support from most colleagues and physicians, but remembers occasional resistance, such

BLAZING TRAILS

as the time when she was chief resident consulting with an older male patient.

“My team looked like a bunch of linemen—in fact, three of them were on the Yale University football team as undergrads.” She recalls that the patient thought she was the physical therapist, until her shocked group of residents corrected him. “I just said, ‘Sir, it’s okay, I understand; if I were a betting man, I’d guess I wasn’t the resident.’”

Her wit, combined with determination she says she inherited from her spirited Italian grandmother, has served Capt. DeMaio well in both of her predominantly male career choices: as an orthopaedist and as a U.S. Navy captain in the Medical Corps. Currently based at the Naval Medical Center in Portsmouth, Va., Capt. DeMaio has been part of overseas missions in Kuwait and Guantanamo Bay, Cuba.

ACHIEVING A STRING OF FIRSTS

Capt. DeMaio has been breaking new ground her entire career. Most notably she was the first:

- Female program chair for the AOSSM Annual Meeting, a position for which she was selected by her Yale mentor and current AOSSM president, **Robert A. Stanton, MD**;
- Military honoree for the AOSSM Excellence in Research Award in 1997 for knee kinematics;

- Female winner of the Berry Award for Excellence in Military Medicine for her research on body armor development;
- Female head team physician at the U.S. Naval Academy; and
- Female orthopaedic consultant for Congress.

In addition, Capt. DeMaio was recently awarded the inaugural Senior Female Physician honor for the entire U.S. Department of Defense. She even operated on President Bill Clinton in 1997 after he tore a quadriceps tendon, and got to fly on Air Force One (which was, she said, “totally cool”).



▲ Capt. DeMaio operated on President Bill Clinton in 1997, after he tore a quadriceps tendon.

Capt. DeMaio’s favorite honor, though, came in 2007, when she was named Teacher of the Year at the Navy Medical Center in Portsmouth. That’s due, in part, to the fact that her grandparents emigrated from Italy to the United States because they believed in the importance of education. Her grandmother completed 8th grade,

and was considered the most educated member of the family at the time.

CARING FOR OUR TROOPS

Because she serves in the Navy, Capt. DeMaio's practice could be described as unusually wide-ranging—her patients are of all ages and involved in a variety of occupations and sports—but she calls it fascinating.

During her time in the Gulf, Capt. DeMaio cared for troops hurt in sports or training injuries, and troops suffering combat injuries such as vehicular trauma and bomb explosions. In fall 2010, she spent two months serving in Guantanamo Bay and hopes to return to serve another tour in Afghanistan soon. As a more senior physician, she's not required to go. Still, she feels it's important to set a good leadership example.

"I'm 51, and [the soldiers] could be my kids. In the medical field, it helps if they see that somebody older is caring for them," she said.

SUPPORTING ORTHOPAEDIC ADVANCES ... FINANCIALLY

"We have the responsibility of giving [patients] the best treatment possible," Capt. DeMaio said. "Part of that is developing state-of-the-art treatments that make sense, and that measure up to the gold standard."

Supporting education and research is now the cornerstone of Capt. DeMaio's philanthropy. She first learned about OREF as a resident, through current

Yale Orthopaedics Chief and OREF Clinical Research Award recipient **Gary E. Friedlaender, MD**. Supporting OREF's mission, it seemed to her, was a logical extension of the Hippocratic Oath.

Capt. DeMaio became a member in the **Alfred R. Shands Jr., MD Circle**, which permanently funds orthopaedic research and education. Donors either make a minimum \$20,000 cash contribution within five years or a deferred gift of \$50,000 or more.

For the past four years, Capt. DeMaio also has been an Order of Merit donor, contributing \$1,000 or more to OREF's Annual Campaign.

"OREF research grant recipients go through a very tough process with a very high level of scrutiny," she said. "OREF is in the business of funding high-quality research, and if you look at the body of research that's come out of the Foundation, it's got a very high success rate."

Supporting OREF, Capt. DeMaio said, is particularly important now that the options for corporate donations have changed. OREF has designed funding opportunities, such as the Clinician Development Program, specifically to provide companies with an opportunity to support orthopaedics while complying with best practices for independence and transparency.

"We're in a period of transition," she said. "Over time, OREF will have a more critical role helping corporations to focus on target-rich environments. Partnerships will be better defined. OREF is going to be a leader in that."



◀ Capt. DeMaio was named Teacher of the Year at the Navy Medical Center in Portsmouth in 2007.



◀ Capt. DeMaio with her practice partner, Claude D. Anderson, MD.

... IN THE LABORATORY

Capt. DeMaio makes time for her own research, including helping to devise The Interceptor, the body armor soldiers are currently wearing in the field. She stressed the need for continued research, especially to develop lightweight, flexible armor. She also is conducting a clinical trial evaluating two hyaluronic acid products for long-term effects on knee cartilage.

But most of her work is clinical, and she realizes how easy it can be to forget the vast amount of research required to develop any new orthopaedic device or procedure. That's why she encourages all orthopaedists to contribute to OREF: Don't be out-of-sight, out-of-mind.

"There's something we do every day, for every patient, that has come from orthopaedic research, and a lot of that has been funded by OREF." ■

Photos courtesy of Capt. DeMaio



▲ Lt. Col. Steven J. Svoboda, MD, USMC

College students who enter the U.S. Military Academy at West Point anticipate a life of public service. Now, through an OREF grant, **Lt. Col. Steven J. Svoboda, MD, USMC** is providing an opportunity for these community-minded young Americans to advance our national interest in an unexpected way.

Lt. Col. Svoboda's OREF grant supports investigation of "Changes in Serum Biomarkers for Cartilage Turnover Following ACL Reconstruction and their Relationship to the Development of Osteoarthritis." West Point cadets are providing blood samples for this study, which may reveal biological indicators to identify and treat postsurgical knee-joint degeneration before

GETTING A LEG UP

OREF grant recipient hopes to help ACL patients leapfrog osteoarthritis

it detracts from quality of life and requires additional invasive and expensive surgery.

"The idea of serum biomarkers as a better strategy to monitor post-ACL reconstruction osteoarthritis isn't new," explained Lt. Col. Svoboda, an orthopaedic surgeon at Keller Army Community Hospital on the West Point campus. "But one major limitation of prior studies has been the lack of pre-injury biomarker benchmarks in postsurgical patients."

According to Lt. Col. Svoboda, West Point cadets are an ideal population to eliminate this limitation. "All cadets have blood drawn when they enter the academy, upon graduation and at two-year intervals as long as they remain in active service," he said. These samples become part of the Department of Defense Serum Repository (DODSR), a biological archive that includes all members of the armed forces, established to aid in medical surveillance, clinical diagnosis and epidemiological monitoring.

Blood samples of cadets who undergo ACL reconstruction offer a unique perspective on biomarker profiles and trends in the same individuals before and after surgery. Plus, the DODSR offers comparable data for their uninjured peers.

"We may gain important clues about normal biomarker values and who's most likely to develop osteoarthritis following ACL reconstruction," said Lt. Col. Svoboda. "Eventually, this work could suggest new intervention strategies before a total knee replacement is needed."

IMPLICATIONS FOR BOTH CIVILIAN AND MILITARY PATIENTS

The American Academy of Orthopaedic Surgeons estimates that 200,000 ACL injuries and 100,000 reconstructions take place annually. There is a growing realization—in part due to AAOS awareness efforts—that ACL injuries pose a significant risk for soldiers as well as athletes and other physically active civilians.

"Young soldiers run on rough terrain carrying heavy equipment, jump off walls and engage in other military activities that put high stress and torque on the lower limbs. Long-term macroeconomic and quality-of-life issues for ACL injury are substantial—for both young soldiers and the civilian population," explained Lt. Col. Svoboda.

ACL reconstructions are performed using a variety of grafts, and current arthroscopically assisted surgical

techniques have short- and mid-term success rates exceeding 90%. However, there is growing evidence that even highly successful reconstruction often can't completely restore long-term optimal knee biomechanics. Early functional success may not eliminate post-traumatic cartilage degeneration and eventual osteoarthritis for a significant percentage of patients.

The current gold standard for detecting post-ACL reconstruction osteoarthritis is a weight-bearing knee X-ray. But soft-tissue damage is already irreversible and has progressed to bone by the time it's visible.

Blood biomarkers could offer a cost-effective alternative to identify early signs of joint degeneration, stratify patients according to osteoarthritis risk and offer a window of intervention before function is severely affected. Early-warning biomarkers might also suggest new molecular targets for eventual new therapies that preserve or reconstitute tissue.

BIOMARKER TRENDS

Lt. Col. Svoboda made some strategic choices in designing his study and selecting biomarkers. "One challenge I faced was not being at a university with a large protein chemistry laboratory that could develop

new tests for previously unstudied biomarkers. I had to choose from the known universe of commercially available enzyme-linked radiosorbent assay (ELISA) kits.

"In fact, the analytic physiology lab I work with at West Point is administratively separate from Keller Army Community Hospital even though the two facilities are on the same campus. My OREF funding enabled me to forge a larger research team with stronger cross-institutional ties than we've fielded before. It's a new model for us."

In addition to considering commercial ELISA availability, Lt. Col. Svoboda chose four biomarkers—CPII, CS846, C1,2C and C2C—based on published literature supporting their connection to the synthesis or breakdown cycles of cartilage turnover, processes closely associated with future osteoarthritis.

The study enrolls 71 cadets who sustained an ACL injury requiring surgical reconstruction during their West Point careers and 71 uninjured controls matched for age, sex and body mass index. All participants have West Point entry and graduation blood samples archived in the DODSR.

The goal is to determine whether statistically significant trends and changes in those four biomarkers can be detected in participants

who underwent ACL reconstruction compared with uninjured participants.

Participants undergoing ACL reconstruction will also have knee X-rays taken to detect evidence of postreconstruction osteoarthritis and if present, determine whether it is tied to consistent signals in pre- and post-surgery biomarker ratios.

"Post-traumatic osteoarthritis is a very active area of research, and there will be interest in building on our OREF-funded results," noted Lt. Col. Svoboda. "Just after I learned of my OREF grant, I attended the 2008 Post-Joint Injury Osteoarthritis Conference, collaboratively sponsored by the American Orthopaedic Society for Sports Medicine and the National Institutes of Health. The conference made clear the enormous impact osteoarthritis has on quality of life and our annual health care outlays. It truly serves our national interest to find better solutions to this disabling condition." ■