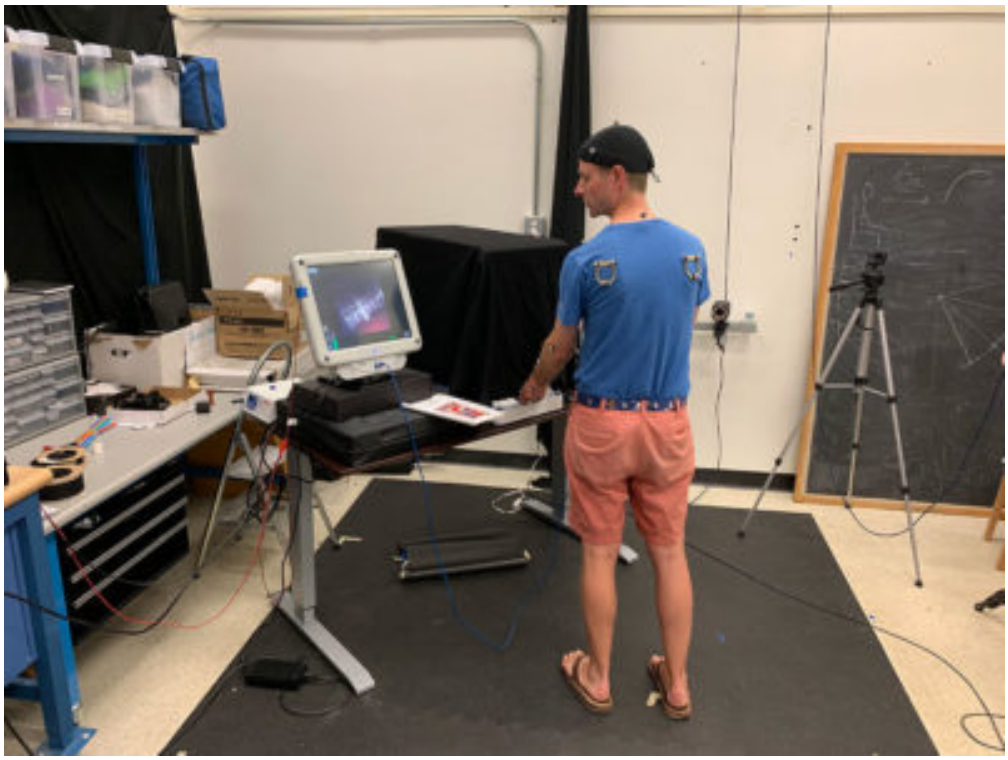
USING MOTION-CAPTURE TECHNOLOGY TO ADVANCE ERGONOMIC STUDIES OF URETEROSCOPY



Eugene Cone, MD, a Harvard Urologic Oncology Fellow, performs a ureteroscopic simulation task in the motion capture laboratory.

Ureteroscopy is one of the most common procedures performed by urologists. Yet little is known about what optimizes the procedure's success, especially in terms of how the urologist holds the ureteroscope and which hand and arm movements are most effective.

A study published in the *Journal of Urology* in 2018 looking at common gestures that surgeons used in performing robotic radical prostatectomy inspired Brigham and Women's Hospital urologist Daniel Arthur Wollin, MD, to conduct similar research analyzing the ergonomics of ureteroscopy.

"You sometimes hear a particular person described as being a really good urological endoscopist, but it's unclear what makes someone good at doing these procedures," he said. "We don't know whether it's speed, consistency, form, economy of motion or particular tricks that they've taught themselves or picked up from others. We wanted to take a closer look."

Using Technology to Monitor Movement

Dr. Wollin decided to use ureteroscopy simulators that are currently available for training purposes to study particular movements and how they correlate to various metrics of procedure success. He did this by labeling volunteers with tracking dots (the same kind that are employed in motion-capture animation) to monitor movements of the torso, head, pelvis, hands and wrists during simulated procedures.

He recruited 12 urologists to participate, six men and six women. Half were residents and half were attendings or fellows. Some had completed endourologic fellowships.

The participants completed 13 different timed tasks for the removal of kidney stones, and their movements were correlated with their procedure times and other measures of success.

"We know there's a wide variety of skill levels in ureteroscopy. There are certain things that will take one urologist hours, and another person can do it in 20 minutes," he said. "Many of these skills build up over time, but they may also be dependent on tricks that people are shown during their

training. One of our goals is to determine whether there are 'right' ways to do certain procedures and, if so, how those things can be taught."

Looking More Deeply at Cause and Effect

Dr. Wollin explained that it's too early to make recommendations based on his studies. But he did offer a few observations. For example, the less a urologist moved their head and body around while performing a complex task, the faster they completed it. This correlation was not seen with simple tasks.

"People may have been moving around more because they were having trouble and needed to shift their bodies around and try a lot of different things," he said. "Or they may have just been people who move around more in general, and those movements led to slower task times. We can't yet differentiate between the two. But we can say that people who move less tended to do better."

Dr. Wollin noted that companies that make ureteroscopes could be interested in his research. "This device was designed 30 or 40 years ago, and given the technology we have today, it's unlikely it would be designed in the same way now," he said. "We would like to be able to gather more data and conduct this research on a larger scale, maybe at a national or international conference. Theoretically, you could map everyone's style while operating the scope and use that information to take a more in-depth look at how it connects to clinical outcomes."