The Robotic Revolution

Jean Joseph, M.D., M.B.A., the Winfield W. Scott Professor and chair of the Department of Urology at the University of Rochester Medical Center (URMC), remembers the day when everything changed.

In 2001, Joseph was one of a handful of surgeons in the U.S. to perform a laparoscopic radical prostatectomy using a robotic surgical system.

Originally conceived in the 1980s by the U.S. military as a system to remotely perform surgeries in war zones, the Intuitive da Vinci® Surgical System was approved by the FDA in 2000. Since then, it has become a ubiquitous presence in many hospital's surgical suites and its use has expanded beyond prostatectomies to partial nephrectomies, cholecystectomies, gynecological, ENT and colorectal procedures, as well as kidney and liver transplants.

Joseph has lost track, but estimates that UR Medicine urologic surgeons have performed over 10,000 robotic procedures over the past two decades. The URMC Urology team was an early adopter of the technology, due to the number of surgeons skilled in laparoscopic urologic surgery, and is now one of the top centers in the U.S. in the volume of robotic procedures with a team of nine experienced urologic surgeons currently using the robots for a range of procedures for both adult and pediatric patients. UR Medicine offers robotic surgery at three of its hospitals: Strong Memorial, Highland and F.F. Thompson.

URMC has been recognized as a leader and innovator in this field by leveraging its research and education missions. UR Medicine surgeons led the study assessing the use of indocyanine green, which is now commonplace in robotic surgery. In 2010, URMC surgeons performed the first live robotic prostatectomy, which

A dedicated robotic simulation suite at Strong Memorial Hospital provides the entire team with an immersive, hands-on surgical environment.

was broadcast to an American Urological Association meeting in San Francisco. More recently, Joseph, Ghazi, Rashid, Wu and Frye performed a robotic prostatectomy and nephrectomy in Rochester that was shared live with attendees of the North American Robotic Surgery Symposium in Las Vegas in 2018. The Rochester team has also been pioneering the use of the da Vinci Single-Port Surgical System, which was recently approved by the FDA.

In 2008, URMC created the Center for Robotic Surgery & Innovation, which was initially led by Joseph, to advance care, research, and training using the technology. A focus of the center is team training, which supports the creation of integrated surgical teams that will deliver consistent and coordinated care of the highest quality.

As the technology has evolved and has been adopted for more procedures, robotic surgery has driven improved outcomes for patients. Studies have demonstrated low risk of serious complications and benefits of laparoscopic surgery, including reduced hospital stays and quicker recovery, less anastomotic stricture, fewer respiratory complications, reduced risk of surgical site infection, and less need for blood transfusion. Research has also shown that hospitals with high volumes of robotic cases have the best patient outcomes.

While robotic surgery has been a boon in terms of improving outcomes, the technology presents challenges in terms of training. Like many other surgical methods, there is a direct correlation between the success of individual surgeons and experience using the robotic system. There is also a steep learning curve in becoming proficient with the system's complex controls. It is estimated that a surgeon requires about 60 cases to become comfortable with the procedure and about 250 cases to become an expert. However, because only one surgeon operates the robot during a procedure, training opportunities during live surgeries are limited.

There are many virtual robotic training and simulation systems, but the team at URMC has taken the concept one step further and developed its own platform to provide both trainees and experienced surgeons with an immersive hands-on training environment. URMC has created a dedicated robotic surgical suite, which allows not only the surgeon but the entire surgical team to train with the system. The Department's Simulation Innovation Lab, which is led by Ghazi, builds lifelike models of human anatomy consisting of entire sections of the abdomen with all of the accompanying skin, fat, muscle and organs that even bleed when cut. The models are then used to replicate the entire procedure from the incisions and insertion of trocars to the completion of the surgery in a team-based simulation environment.

The work of the UR Medicine urological team has paved the way for many other disciplines to safely embark on robotic procedures with associated benefits to patients.
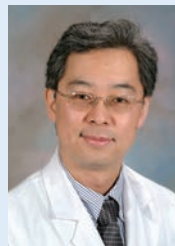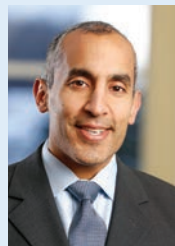
UR Medicine Department of Urology Robotic Surgery Team
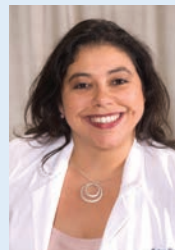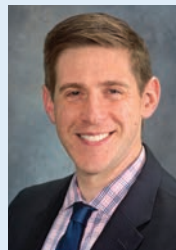
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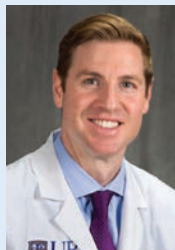
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