Cardiologist Dr. Eugene Fu operates using a new robot for heart catheters at Riverside Methodist Hospital. "Once I sat down there in front of this console with all this information in front of me … it's like going from having to ride a bike every day to work to being able to drive a car," Fu said.

Fu prepares to use Sensei, the latest medical-robot entry in the Columbus market. The robot threads catheters into hard-to-reach spots in the heart.

The arm of a Sensei robot can be seen above the patient's legs at Riverside.

ROBOSURGEON

Hospitals increasingly turn to robotics to aid in the operating room

By Misti Crane THE COLUMBUS DISPATCH

Robots don't tire. They never have shaky, too-muchcoffee hands. And they can finesse their way into the most incredible places without making much of a mark.

These are some of the job qualifications that have landed robots top surgical jobs in hospitals throughout Columbus and around the world. What started as kind of a gee-whiz medical development less than a decade ago has evolved into an increasingly commonplace tool that allows surgeons and doctors to go more safely into hard-tonavigate spots and, in many cases, affords their patients a speedier recovery and less scar tissue.

Before you get any ideas: We're not talking about R2-D2 rolling into the operating room and demanding a scalpel.

Medical robots basically serve as a doctor's hands and depend entirely on human direction to work.

Doctors sit at consoles resembling video games and use joysticks to control robots that take surgical tools through small incisions into chests, guts or legs. The latest entry in the Columbus market is a robot called Sensei that threads catheters into hard-to-reach spots in the heart, where they can diagnose problems and stop life-threatening irregular rhythms.

Perks for the doctor include more control and accuracy and reduced exposure to radiation because the doctor is at a remote work station, away from radiation that's used to show images of the heart.

In more complex cases of heart arrhythmia, it can be a struggle to manually navigate catheters to difficult-to-reach spots while the heart beats and moves up and down as the patient breathes, said Dr. Eugene Fu, a Riverside Methodist Hospital cardiologist.

"It's crucial that the catheter stays stable and goes where it needs to go and stays there," he said.

After three or four hours of working on a difficult case, a doctor can find that a catheter slips from where it needs to be, he said, particularly if the case requires awkward hand contortions.

The robot, however, is "just as precise at the end as the beginning," Fu said.

The only potential disadvantage he's noticed with the robot is that it requires a slightly larger incision to place the catheter into the vein. The company — Hansen Medical — is working on that.

"Once I sat down there in front of this console with all this information in front of me … it's like going from having to ride a bike every day to work to being able to drive a car," Fu said.

For now, the robot — which cost the hospital about $700,000 — will be used for the most complex cases, Fu said. As he looks forward, though, he can see robots assisting in all catheterization procedures. In the most recent fiscal year, Riverside doctors performed 11,063 heart catheterizations.

Dr. Rodney P. Horton, who works at Texas Cardiac Arrhythmia, also was among the first to use the

Sensei. He praised its ability to stay steady after hours in the cath lab.

"It provides better precision when you're trying to make real subtle movements," he said.

Horton said he imagines a day when three-dimensional images combined with touch-screen technology will allow him to draw on the screen what he wants to accomplish and then program a robot to execute the treatment. "I think that's the future."

The first robot to gain widespread attention — and the brand that is making the most significant impact in operating rooms throughout the world — is the da Vinci.

Ohio State University surgeons pioneered use of the surgical system for heart bypass in 2000. Since then, the robot has taken off and is now used to fix hearts, perform hysterectomies and remove prostates, among other things.

Mount Carmel West, Riverside and Ohio State use the robot.

The brains behind the da Vinci was Fred Moll, who founded the company Intuitive Surgical in 1995. The da Vinci was approved by the Food and Drug Administration in 2001.

"Ten years ago if you would have tried to convince people that the surgeon was going to use electronic control of the instruments that they were delivering therapy with, they would look at you like you had two heads," Moll said.

Moll, who later founded Hansen and is the company's chief executive officer, said his interest was piqued in the early '90s by an attempt by the Defense Department to use robotics in the battlefield. The idea — to allow surgeons to operate from remote locations while their patients were in dicey areas — never took off, he said.

"It was kind of misdirected, but it was the first time that I had seen and anybody demonstrated the ability to do telesurgery," he said. "I saw it as a way to dramatically improve minimally invasive technique."

Minimally invasive surgery is doctorspeak for operations that require two or three small incisions rather than one big cut. The approach revolutionized surgery but has its limits. Tools inserted into the body don't touch the dexterity of the human hand.

The robot, though, has flexible wrists of sorts.

And it follows direction.

"A lot of people find it to be enabling," Moll said.

The major limitation of robotics — something that takes surgeons and doctors a while to get used to — is that they can't feel the push and pull of instruments against tissue.

But the Sensei robot measures the force of the tip of the catheter, something that Fu said is quite helpful.

Still, "Robots, for at least as long as I'm going to be alive, aren't going to get anywhere near the capability that a human hand and brain afford a physician," Moll said.

They do, however, help minimize incisions and help patients go home sooner and recover faster.

At Mount Carmel West, gynecologists, urologists, general surgeons and others are using the da Vinci system regularly and with great success, said Dr. Terry Grogg, an obstetrician-gynecologist who has championed robotic surgery.

Hysterectomies are the most common surgery he performs with the da Vinci, but it has many applications, Grogg said.

He compared minimally invasive surgery without the robot to operating with chopsticks.

"Tying knots, sewing, all the fine manipulation is very difficult," he said.

With the robot, "The instruments act just like my hands."

And although shaky hands aren't a problem he encounters often, Grogg said the robot eliminates that concern.

Hysterectomies traditionally meant a two- to three-day hospital stay for his patients, he said. With the robotic surgery — which he's doing almost exclusively now — they often go home within 12 hours. They lose less blood, they're off work fewer days, and they heal more quickly.

Doctors must be adequately trained to make the transition, and there is a learning curve, he said.

Lynda Petty, director of perioperative services at Ohio State, said not only does the hospital have a robust robotic surgery program, but it also has robots carrying trash, dirty sheets, food and biohazardous materials.

As the first hospital in the United States to buy a da Vinci, Ohio State has taken a leading role in training doctors and nurses from elsewhere, she said.

Moll said he has a hard time thinking of areas that robotics won't affect in medicine.

Companies have used robots for orthopedic surgery as well as hair replacement.

"I honestly can't think of a surgical or medical specialty that can't benefit from robotics if you define robotics broadly enough."

Going robotic

The makers of robotic surgical equipment say these tools can be used in a growing number of minimally invasive procedures.

These include:

- Heart catheterization
- Heart bypass
- Hysterectomy
- Prostatectomy

Benefits include:

- Less pain
- Less blood loss and a lower risk of infection
- Fewer complications
- Less scarring
- Shorter hospital stays
- Faster return to normal daily activities

Sources: Hansen Medical; Intuitive Surgical