Use of robots for minimally invasive surgery is expected to grow over the next 5 years as surgeons and patients become more comfortable with this technology.

But without proper planning, utilization of these $1 million devices can be lower than expected, says Joyce Berger, RN, MPH, senior advisor with the Health Technology Center (Health-Tech), a nonprofit health care technology forecasting organization based in San Francisco.

Hospitals purchasing the cutting-edge technology face the danger of falling into the “coat-rack phenomenon,” Berger says. This occurs when an enterprising surgeon lobbies the hospital to purchase a robot, then it’s set aside because the surgeon and staff did not realize how much time it would take to learn to use it.

“It takes a real push by both the OR management team and the surgeons to really utilize it effectively,” says Berger. “There’s a high learning curve—initially, it takes a long time to set up and break down, and procedures are slower. But with practice and real focus on its use, that turns around.” (See related article.)

Results promising

There are few randomized studies, but early results with surgical robots have been promising. Robots have been used most effectively for prostatectomy, heart valve replacement, and tubal reanastomosis in gynecology as well as esophagectomy, antireflux, and bariatric procedures, according to the Feb 16 *JAMA*.

Use has grown from just 1,500 to 2,000 procedures in 2000 to an estimated 20,000 last year, the March 14 *Business Week* reports.

Because of greater surgical precision, patients having robot-assisted surgery have had shorter hospital stays; less pain; and decreased risks of infection, blood loss, and scarring, experts say. Depending on the procedure, patients can return to normal activity in a shorter time than with conventional surgery. At City of Hope in Duarte, Calif, which has one of the highest volumes of robotic radical prostatectomies, patients having robotic surgery are achieving complete bladder control within 1 month, compared to 3 months with laparoscopic surgery and 5 months with open procedures. Surgeons there say potency rates are “significantly improved” with robotics.

The Food and Drug Administration (FDA) approved one robotically assisted surgical device, the da Vinci Robotic Surgical System, about 4 years ago. The device is marketed by Intuitive Surgical Inc, Sunnyvale, Calif (www.intuitivesurgical.com). In all, 286 units have been sold globally, including 201 in the US.

By 2009, 10% of minimally invasive surgeries, including 15% of all radical prostatectomies, are expected to be performed robotically, according to a HealthTech report.

So far, approximately 50% of the surgical robot’s procedures have been urologic, with cardiothoracic and general abdominal surgeries each accounting for 25%, says Anil Rao, research project manager with HealthTech.

Robotics is beginning to move into community hospitals. “It’s not just something geared toward the academic centers now,” he says, noting that 70% of recent sales have been to nonteaching hospitals.

Expensive decision

Embarking on robotics is a costly decision.

Hospitals can’t expect additional reimbursement, and the return on investment has been soft. Hospitals that have adopted the technology have done so primarily to enhance their image for high technology with the hope of attracting more business.
HealthTech projects that as there are more positive outcomes studies, professional societies will advocate for premium reimbursement covering the increased costs of using robotics, and surgeons will drive utilization higher.

Patient demand could drive some of the change.

“There are indications that patients prefer robotic surgery over conventional methods,” Rao says. That could eventually lead to increased market share. One reason patients request robotic surgery is reduced recovery time, primarily because the robots are more precise in nerve dissection and bleeding reduction, Rao says.

“The size of the robotic arms and wrists are 8 millimeters now, and they’re going down to 5 and then to 3 millimeters over the next couple years,” Rao says. Compared to the human hand, robots are much more precise.

“When you’re talking about nerve-sparing procedures such as a radical prostatectomy, the advantage of the robot really comes into play,” he adds.

A question about use of robotics in urologic procedures has been about potency rates compared with conventional surgery. “(In studies) the potency rates are actually comparable to open surgery after the learning curve is overcome. And the learning curve appears to be about 25 to 35 operations,” Rao says.

The da Vinci system works like this. The surgeon sits at the system’s console and controls movement of the robotic arms, which hold the endoscope and tiny surgical instruments inserted into the patient’s body through small incisions. Using the controls, the surgeon manipulates the endoscope and surgical instruments inside the patient.

“One advantage of the robot is that it is a digital device, and you can actually record manual motion or an entire procedure for follow-along training purposes,” Berger says. The storage of digital images should be part of the planning and should be worked out in advance with the information technology department, she says.

Surgical robots typically are housed in the OR. “To our knowledge, the robot has not been used for endovascular surgeries that could be performed in the interventional suite,” Rao says.

**Education is key**

Education of surgeons and staff and clear procedures for use are keys to avoiding low utilization of the surgical robot, Berger says. “We’ve spoken to a few surgeons who say that the first time they use this, or the first couple of times, the procedure time can double or triple,” Berger says. Once the surgeon becomes proficient, and the nursing staff is accustomed to setting up the equipment, the time drops to about an additional 15 to 20 minutes for the procedure.

Initial training for surgeons is at 3- or 4-day off-site seminars. The manufacturer offers a 2-day introductory course at $6,000 per physician. An advanced procedure lab costs another $6,000 for the 2-day training. The company also offers a course for nurses and ancillary staff.

Once staff and surgeons have been trained and become efficient in use of the device, staffing is the same as for conventional minimally invasive cases, Rao says.

The report also predicts robots will intensify turf battles between surgeons and interventional radiologists. Surgical robots are expected to advance surgery and interventional treatments as they become the next-generation platform for the delivery of biologic agents and directed-energy therapies.

—Jay Greene

*Jay Greene is a freelance writer in St Paul, Minn.*
Evaluating purchase of a surgical robot

• Determine which laparoscopic procedures can successfully be converted to robotic procedures using existing physician resources. Urological, cardiothoracic, and general abdominal surgeries drive the primary usage of current surgical robots.
• Assess the impact of acquiring a surgical robot on market share and surgical volume.
• Consider the time and financial investment into initial, vendor-based, and hospital-based training. Vendor-based training is typically $6,000 per physician for a 2-day, hands-on session.
• Consider space requirements in the OR to accommodate the robotic equipment.
• Consider the business case for investment in a robot, including marketing, operational, and financial issues.
• Operational and financial return on investment (ROI) is likely to be low in the early years. Measure the marketing ROI in terms of market share, total admissions, and dollars in philanthropy.
• Determine whether your information technology infrastructure has the ability to store digital preoperative planning images and intraoperative videos for outcomes analyses.

Source: Health Technology Center, San Francisco.