Use of Robotics in Oncology Surgery

Susan Doyle-Lindrud, DNP, AOCNP®, DCC

Robotic surgery is an exciting technology that allows the surgeon to sit at a computer console near the operating table, using mechanical arms with surgical instruments attached to them. This type of surgery is minimally invasive, and the procedure is performed through tiny incisions. This technology is widely used in the United States and is expected to evolve over time with an increase in the number and types of procedures.

At a Glance
- Robotic surgery will increasingly play a role in oncology surgery.
- Benefits include decreases in blood loss and postoperative pain.
- Barriers include the cost and maintenance of the systems.

Potential Benefits

Minimally invasive surgery began in 1987 with laparoscopic cholecystectomy (Polychronidis, Laftsidis, Bounovas, & Simopoulos, 2008). The advantages of laparoscopic surgery over conventional surgery are smaller incisions, less blood loss, less postoperative pain, and shorter hospital stays. The weaknesses of this approach include the loss of natural hand-eye coordination and dexterity, making delicate dissections and anastomoses more difficult (Lanfranco, Castellanos, Desai, & Meyers, 2004). Robotic surgery was developed with the hope of overcoming these laparoscopic obstacles. One of the advantages of robot-assisted laparoscopy over conventional laparoscopy is the provision of three-dimensional images of the operative field instead of two-dimensional images. The robot also stabilizes the instruments, minimizing surgeon tremor and improving ergonomics for the operating surgeon. The surgeon can be in a seated position rather than standing, decreasing surgeon fatigue (Herron & Marohn, 2008; Oppenheimer, Weghorst, MacFarlane, & Sinanan, 1999). Conventional and robotic laparoscopy may have advantages over the open surgical laparotomies, including potentially shorter hospital stays, decreased blood loss, faster postoperative recovery, and improved aesthetics of incision areas because of the smaller incisions (Reza, Maeso, Blasco, & Andrades, 2010). Robotic surgeries are now performed in oncoologic (Hayn et al., 2010), non-oncologic (Mufarrij, Shah, Berger, & Stifflman, 2007), pediatric (Peters, 2004), and urologic procedures (Ghani et al., 2013).

Barriers

Robotic surgical systems have high fixed costs, with prices ranging from $1 million to $2.5 million for each unit, as well as significant annual maintenance costs of about $100,000–$150,000 per unit (Intuitive Surgical, Inc., 2014). On average, the additional expense associated with robotic-assisted approaches is $1,600 per procedure, as compared to open surgery. If robotic technology replaces traditional surgery, it could mean about a $2.5 billion increase in healthcare costs. In addition, surgeons must perform 150–250 procedures to become adept in using the system (Barbash & Glied, 2010).

One example of a surgery that has a rapidly rising number of procedures performed by a robot is robot-assisted...
prostatectomy. On average, prostatectomy surgery is performed by surgeons less than 10 times per year, making it difficult to obtain the necessary hours to make a doctor skilled in the procedure (Savage & Vickers, 2009). Limited benefit from the procedure has been observed based on studies comparing radical prostatectomy surgery and robot-assisted prostatectomy (Kaye, Mullins, Carter, & Bivalacqua, 2014). The findings from studies exploring quality of life after prostate surgery have been mixed. In one study with patients who had undergone a robot-assisted radical prostatectomy, participants were more dissatisfied with their outcomes than patients undergoing an open radical prostatectomy (Malcolm et al., 2010; Schroeck et al., 2008).

Conclusion

Robotic surgeries are a technology that will continue to evolve over time. The number of robotic surgical procedures and types of procedures will likely continue to rise. These new technologies are marketed to physicians and consumers, with surgeons wanting to keep up with market demand and hospitals wanting to attract and retain surgeons (Barbash & Glied, 2010). A consensus document on robotic surgery developed in 2007 by the leadership of the Society of American Gastrointestinal and Endoscopic Surgeons and the Minimally Invasive Robotic Association provided recommended guidelines for the training and credentialing of physicians to maintain better uniformity of standards. The guidelines call for formal specialty training in robotic surgery, with a curriculum that includes therapeutic robotic devices, documentation of practical experience, an appropriate volume of cases with satisfactory outcomes with an expert proctor, and formal assessment of competency (Herron & Marohn, 2008). Outcome studies comparing the outcomes from various robotic surgeries to laparoscopic or open procedures need to be done. These studies will better inform surgeons, healthcare organizations, hospitals, insurance companies, and the public on the benefits and risks of the robotic technology for specific procedures. Ultimately, patients and the healthcare system will benefit from looking at the data to determine which types of surgical procedures result in the best and most cost-effective outcomes.

References


