Medical Xpress

Robot-assisted surgery: Hospital-level policies key to maximizing benefits, managing costs

February 19 2020, by Phil Ciciora

Robot-assisted surgery is a major advancement in minimally invasive surgical care delivery, making it imperative for hospitals to codify policies that leverage the quality benefits while managing the cost, says Ujjal Kumar Mukherjee, a professor of business administration at the Gies College of Business at Illinois who studies innovation in health care. Credit: L. Brian Stauffer

Hospital-level operational policies regarding the most effective way to deploy a surgical robot are necessary in order to maximize clinical outcomes and minimize the costs associated with its use, says a University of Illinois at Urbana-Champaign expert who studies innovation in health care.

In the field of health care technology, surgical robots are known to deliver superior surgical quality, albeit at a much higher cost. But questions remain about when and how often to employ them, making it imperative for hospitals to codify policies that leverage the quality benefits of robot-assisted surgery while simultaneously managing cost, said Ujjal Kumar Mukherjee, a professor of business administration at the Gies College of Business at Illinois.

"Robot-assisted surgery is a major advancement in minimally invasive surgical care delivery that allows surgeons improved precision in surgical tasks, superior accessibility, enhanced dexterity of surgical tool movement, auto-dampening of hand tremors and three-dimensional vision of the surgical field," he said. "But if you set aside the clinical outcome benefits—such as reduced blood loss and surgical duration, and shorter length-of-stay at a hospital—the cost of performing robot-assisted surgery is significantly higher than regular surgery due to the investments needed for robot acquisition, maintenance and procurement of surgical accessories."

And not all patients benefit equally from robot-assisted surgeries compared with the traditional alternative of manual laparoscopic surgeries. Similarly, significant variation in benefits of surgical robots exist across different surgical procedures.

"All of those factors combined argue in favor of adopting a policy framework that can lead to significantly better patient outcomes," Mukherjee said.

In a new study, Mukherjee and co-author Kingshuk K. Sinha of the University of Minnesota compared clinical outcome data from a large multi-specialty hospital for a surgical procedure—in this case, hysterectomies—performed with a surgical robot versus performed via manual laparoscopy.

The researchers also spent significant time at a partner hospital observing robotic-surgical procedures, especially those specifically related to OB-GYN procedures. "We also analyzed the operational policies that have the potential to be implementable at hospitals to realize clinical outcome benefits while also controlling the cost of health care delivery enabled by advanced technologies," Mukherjee said.

The in-depth field study combined with empirical data analysis and simulation modeling led the researchers to conclude that the quality benefits of robotic surgeries accrue much more for patients who have critical levels of disease severity, leading them to recommend that robot-assisted surgeries be preferentially assigned to high-severity patients and manual laparoscopic surgeries assigned to low-severity patients.

The researchers also recommended limiting the size of the robot-trained surgeon pool to allow them to gain experience and learn better surgical techniques, and adopting a minimum experience threshold for surgeons in the pool.

"Our results demonstrate that that these policies can lead to significantly better quality and lower cost of complex surgeries, and help expand surgical delivery capacity to a much wider population," Mukherjee said.

Allowing a focused group of interested surgeons to consistently perform surgeries on the robot expedites surgeon learning, Mukherjee said.

"Surgeons learn from cumulative experience on the surgical robot, and

surgeons learn faster when they perform surgeries on patients with high severity of disease condition," he said. "A surprising number of hospitals with a surgical robot allow a large pool of surgeons to use the robot, which creates a lack of focus in the surgical team and therefore higher surgical duration and cost, along with lower surgical quality. Hospital management needs to active engage in surgical teams' training and skill development through learning-by-doing."

For health care administrators, the findings speak to the growing need for top-down hospital-level operational policies governing advanced technologies and their adoption in health care settings, Mukherjee said.

"Hospitals play a proactive role in setting policy guidelines to improve the clinical outcome benefits and affordability of robot-assisted surgery," he said. "Those policies have the potential to inform effective hospital-level implementation of U.S. federal government initiatives such as the Patient Protection and Affordable Care Act and the Hospital Value-Based Purchasing Program."

The paper was published in the *Journal of Operations Management*.

  More information: Ujjal K. Mukherjee et al. Robot-assisted surgical care delivery at a hospital: Policies for maximizing clinical outcome benefits and minimizing costs, *Journal of Operations Management* (2019). DOI: 10.1002/joom.1058

Provided by University of Illinois at Urbana-Champaign