



## Just what is the cost of robotic surgery?



The use of robotics surgery, especially in the U.S. and other developed countries, is on the rise despite evidence questioning its clinical benefit. UCLA researchers have conducted a study to determine how much hospitals spend on acquiring and operating a robotic system. The aim is to establish a cost benchmark that can inform future cost-effectiveness evaluations of this technology.

Currently, Intuitive Surgical Inc. supplies most robotic technology, and all their revenue comes from system, service, and instrument sales. The minimum cost to hospitals therefore can be estimated by examining the revenue in this company's financial statements, according to Christopher P. Childers, MD, and Melinda Maggard-Gibbons, MD, MSHS, both with the Department of Surgery, David Geffen School of Medicine at University of California, Los Angeles.

"The robotic surgical procedure market is large and increasing; in 2017, hospitals paid the primary supplier more than \$3 billion, equating to \$3,568 per procedure," write the authors in a research letter published in JAMA.

For this study, the authors reviewed the supplier's financial statements (Form 10-K annual reports) from January 1999 to December 2017. Data were extracted and summarised for robot system sales, revenue sources (systems, service, instruments and accessories; rounded to the nearest \$100,000) and approximate procedure volumes by speciality (gynaecology, general surgery, urology). Procedure information is entered into the robotic platform for each case and is transmitted to the company. "Robot systems" refer to the sale or lease of the platform. "Service" refers to the maintenance and training contract. "Instruments and accessories" include finite-lifetime parts, endoscopes, simulators, and supplies (e.g., drapes). To hospitals, system revenue is an acquisition cost with service and instrument and accessory revenue as fixed and variable operating expenses, respectively.

By the end of 2017, 4,409 robotic platforms were installed globally including 2,862 (65 percent) in the United States. The estimated annual procedure volume increased from 136,000 in 2008 to 877,000 in 2017. In 2017, 644,000 procedures (73 percent) were performed in the U.S. From 2010 to 2017, general surgery procedure volume increased the fastest (10,000 to 246,000) followed by gynaecology (123,000 to 252,000) and urology (85,000 to 118,000).

Total revenue in 2017 was \$3.1 billion, with \$2.3 billion (73 percent) domestically. In 2017, 52 percent of revenue was derived from instruments and accessories, 29 percent from robot systems, and 19 percent from service. Dividing the total spending on robotic technology by the total number of robotic procedures performed in 2017 yielded a cost per procedure of \$3,568, with \$1,866 for instruments and accessories, \$1,038 for robot

systems, and \$663 for the service contract.

"In this study, the instruments and accessories used in robotic surgery cost an average of \$1,866 per procedure. In part, this reflects a limitation imposed by the company because of specifications to not use most instruments for more than 10 procedures. To our knowledge, no clinical data support this limit," the authors note. "In addition, \$1,701 per procedure was dedicated to purchasing and maintaining the system, costs that are novel to robotic surgical procedures."

Before robotic surgery, the authors say, total operating room costs for common general surgery procedures ranged from \$3,000 (cholecystectomy) to \$7,000 (pancreatectomy). Instruments account for less than 20 percent of this cost because they are relatively inexpensive. For example, the marginal cost of a reusable instrument set is less than a few hundred dollars per procedure and disposable instruments, although more expensive, still cost less than \$1,000 for common laparoscopic procedures.

The primary limitation of this study is the ability to estimate only the hospital costs imposed by the manufacturer. "Because robotic surgery increases operating room time, and there are other hospital expenses such as staff training, infrastructure upgrades, and marketing, this study's estimate represents the lower bound for the total cost of this technology," the authors explain.

In conclusion, the authors say the continued use of the robotic platform in surgery requires demonstrating the superior clinical benefit of these devices while considering the full set of costs for these systems.

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