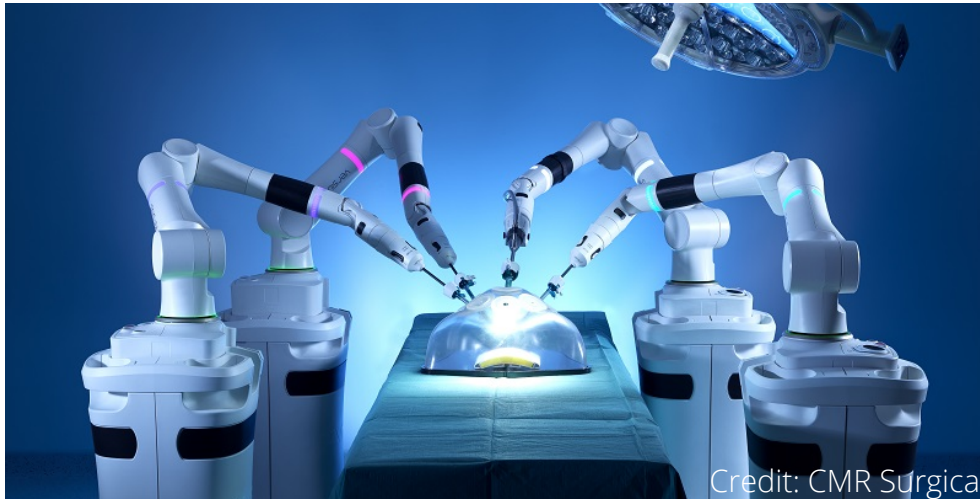


The Influence of Surgical Robotics



Over the past thirty years, the presence of surgical robotics has increased dramatically as the technology started to adapt from industrial robotics (1). With the increase in usage, there has been an increase in the influence of surgical robotics across the world. However, there are still many obstacles impeding its progress. Cost, practicality, and acceptability are just some of the barriers that must be overcome to see surgical robots in all medical facilities. While surgical robotics has seen a rapid increase in acceptance and use, their influence can be widened even more by decreasing the cost, proving that it is superior to traditional surgical techniques, and meeting the demands of the surgeons who use them.

Some of the obstacles that have inhibited the influence of using surgical robotics are that they

are extremely expensive, not trusted to autonomously operate, and they have not yet widely shown monetary or patient benefits. The overwhelming fiscal drain that is required to obtain a developed system is one of the reasons why surgical robotics has not extended their influence to every medical institution across the globe. The da Vinci surgical system, which has been around since the early 2000s, costs upwards of \$3 million to buy and maintain (2). Since the cost is very high, it increases the cost of the surgery on the patient's end. In some cases, it can cost \$3,000 more than a traditional surgery (3). This high cost is a drawback that surgical robotics will have to overcome to gain widespread influence. What makes this even worse is that many patients do not see any improvements in the operation or recovery time. Medical facilities and patients have not seen the

1 From Gyles, C. (2019). Robots in medicine. *The Canadian Veterinary Journal*, 60(8). <https://doi.org/PMC6625162>

2 From Ho, C., Tsakonas, E., & Tran, K. Table 16, Capital and Operating Costs of da Vinci Surgical System* - Robot-Assisted Surgery Compared with Open Surgery and Laparoscopic Surgery: Clinical Effectiveness and Economic Analyses - NCBI Bookshelf. Robot-Assisted Surgery Compared with Open Surgery and Laparoscopic Surgery: Clinical Effectiveness and Economic Analyses [Internet]. <https://www.ncbi.nlm.nih.gov/books/NBK168933/table/T16/>.

3 Scott, C. (2015, February 12). Is da Vinci Robotic Surgery a Revolution or a Ripoff? Is da Vinci Robotic Surgery a Revolution or a Rip-off? <https://www.healthline.com/health-news/is-da-vinci-robotic-surgery-revolution-or-ripoff-021215>.

4 Robot-Assisted Surgery. The Alliance of Advanced BioMedical Engineering. (2018). <https://aabme.asme.org/posts/robotassisted-surgery>.

return that these robots promise to provide. While surgical robotics claims to be a miracle solution, patients see very little improvements compared to what they would have received in a traditional surgery (4).

Additionally, there has been some pushback by surgeons that has affected how these robots are used. In the early generation of surgical robotics, many of the systems were autonomous, but surgeons did not like them as they felt like they

were being replaced. They wanted a tool to aid in surgeries, not a robotic system to replace them (5). This puts a damper in the progress of surgical robotics, and in the newer generations as there are still some demands that are not being met. Surgeons want the interface to have more haptic feedback or better tactile responses (6). In other words, they want to be able to feel what is going on even when they are using the surgical system. Until this demand and others are met, surgical robotics will still face challenges to their expansion.

5 Robot-Assisted Surgery. The Alliance of Advanced BioMedical Engineering. (2018). <https://aabme.asme.org/posts/robot-assisted-surgery>.

6 From Bergeles, C., & Yang, G.-Z. (2014). From Passive Tool Holders to Microsurgeons: Safer, Smaller, Smarter Surgical Robots. *IEEE Transactions on Biomedical Engineering*, 61(5), 1565-1576. <https://doi.org/10.1109/tbme.2013.2293815>

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Figure 1. Da Vinci Machine. Adapted from "Robotic surgery: a race to the top," by C. Kent. 2020, March 31. Medical Device Network. Credit: CMR Surgical.