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STOCK STORY

INTUITIVE SURGICAL

FIRST PUBLISHED MAY 2024

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The concept of robotic-assisted surgery was first put forward in the late 1960s but took decades to be realised. Since then, the technology has transformed the experience and outcome for millions of patients worldwide. Intuitive Surgical has been at the forefront of this technology for almost 30 years and, with the launch of its latest da Vinci 5 robot, looks set to maintain its leading-edge advantage.

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There is a video on YouTube featuring a peeled grape being stitched back together by a surgical robot that has garnered almost 10m views. The precision and delicate nature of the intricate procedure is remarkable and, arguably, far more palatable than watching one of the actual operations the device is designed to carry out. The robot is a da Vinci system, designed and manufactured by Intuitive Surgical, to perform minimally invasive surgery.

To go back in time, surgery wasn't always "minimally invasive". Indeed, 200 years ago, it was downright dangerous and excruciatingly painful. Mortality rates were high with many patients who lived to tell the tale subsequently dying of infection. Mercifully, there have been great medical advancements over the years with the likes of anaesthetics, sterilisation of equipment and antibiotics. However, even today, when it comes to surgery, there continue to be stubbornly high complication rates, a huge disparity in surgical outcomes and poor access to quality care. The relatively recent technology involving robotics has the potential to make a meaningful difference.

"The da Vinci robot has evolved over the past two and a half decades"

Born out of Stanford Research Institute's pioneering of telerobotic surgery for the US Army in the 1980s, Intuitive Surgical was established in 1995. Its first robotic prototype was given the name "Lenny" after Leonardo da Vinci and, in 2000, its da Vinci system received FDA approval for use in various minimally invasive surgical procedures.

Whilst the da Vinci robot has evolved over the past two and a half decades, each generation has shared some fundamental technology. There are three key components: the surgeon's console where the practitioner controls the instruments using his hands and feet whilst viewing a high-definition 3D screen of the patient's anatomy; the patient cart, which comprises the camera and three or four robotic arms which hold the instruments being controlled by the surgeon and, lastly, the vision cart which allows other operating room staff to view the procedure.

From a surgeon's perspective, the combination of robotic arms that can be angled in all directions and dual cameras, whereby the patient's anatomy is viewed in 3D, provides greater dexterity and visibility as well as more accurate control and precision of surgical instruments.

More importantly, Intuitive's products have been shown to deliver better and more consistent surgical outcomes for patients, with faster recovery times and reduced complications, including reduced re-admission risks.

"In 2023, da Vinci systems completed 2.2 million procedures in 71 countries"

While it would be difficult to argue against better patient outcomes, there is an encouraging economic story for hospitals too. Unsurprisingly, the robotic-assisted surgery option is not cheap but, as health systems increasingly adopt a more value-based approach, and therefore consider direct and indirect costs of the surgical procedure, the all-in cost of using robots is in fact proving to be lower than the alternative.

Globally, there are around 300 million major surgeries performed every year. In 2023, da Vinci systems completed 2.2 million procedures in 71 countries. With such low adoption rates, the market opportunity is vast. According to Intuitive, robotic-assisted surgery could be approved for 21 million procedures as the technology becomes the standard level of care in more countries.

Given some of these numbers, it's no surprise that Intuitive is the global leader in its field. The question at this juncture could be whether it can maintain its competitive edge. However, the company has already built an exceptionally strong competitive moat thanks to the unique ecosystem it's built through its products, its training of more than 76,000 surgeons worldwide and the clinical evidence generated to support the use of robotic-assisted surgery.

Arguably, one of Intuitive's greatest advantages over its peers is in the enormous amount of data it has accumulated over more than 25 years. This includes everything from the raw video feeds of surgeries performed to which instruments are used for what and for how long, as well as the movements of the instruments and camera over time, as and when a surgeon uses an instrument and the precise wrist angle of their hands. There is even data available on the interactions between instruments and the tissue. With more than 14.2 million procedures performed to date across the da Vinci systems currently in use, the number of possible data points are almost infinite.

"Surgeons can use an AI-powered visualisation tool to get an idea of a patient's specific anatomy before a procedure"

As with other industries, medical surgery is moving into its digital era, with the use of AI-enabled applications and digital capabilities a very tangible reality. With its abundance of data, Intuitive is already leveraging this

advantage within its digital tools. For example, on a new app called Iris, surgeons can use an AI-powered visualisation tool to get an idea of a patient's specific anatomy before a procedure, then use virtual-reality-enabled simulator programmes to hone their skills in advance.

The company has also recently developed the Intuitive Hub, a platform that allows surgeons to record procedures for training and development purposes. It's possible to use telepresence for real-time observations and collaboration. I was lucky enough to witness an early version of this technology almost a decade ago. Visiting North Carolina, I watched an experienced surgeon in a hospital there walk a colleague, based in India, through a complex cancer surgery step by step.

Taking this idea to the next level, Intuitive's vision is for every surgeon using a da Vinci system to have something akin to a digital copilot to observe and support them in their work. With enough data, management is confident that it will be possible to develop predictive insights into which choices of surgical technique tend to the linked to the best patient outcomes. With these insights, the computer can 'observe' a procedure taking place and offer specific feedback in real-time. This is where Intuitive's very latest robot comes in. In February, when I visited the company's headquarters in Sunnyvale, California, the da Vinci 5 had yet to receive FDA approval (which it has now) but there was palpable excitement about its potential. In addition to its 150 new design features, it has 10,000x the computing power of the previous model. With this very clear emphasis on its computational power and ability to harness the company's decades of captured surgical data.

"Opportunities for improvement are decades long"

AI and machine learning may have become over-used terms in many other realms of life but there are few more tangible examples of how the technology can benefit people's physical lives than this. A company like Intuitive's historical data, and analysis thereof, will ultimately lead to better patient outcomes whilst reducing costs for hospitals. Having been leading edge since its early days, these latest advances demonstrate the company's capacity to rarely sit still. In the words of long-standing CEO Gary Guthart, when he spoke at Walter Scott's virtual conference in 2021, "The job is never done. Opportunities for improvement are decades long."

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