

Robotic Surgeon: Surgeon of the Future

Westminster Christian Elementary
School

Warrior Robotics

Team 6855A

Valeria Hernandez, Valentina
Rodriguez, T.J. Arner, Manny
Gonzalez, Karen Izquierdo

This is one version of a
Da Vinci Robot

Picture Source: www.medtronic.com





How to Become a Robotic Surgeon...

Before going to medical school you must have a bachelor's degree . Then a surgeon must go to medical school for another four years. Next, depending on what kind of surgeon you want to be you must do 3-7 years of internship and residency experience where they get more hands-on training. Surgeons who want to have robots assist them in surgery must do extra training to control the robot. Training with the robot is very important, it is a more complex tool than knives and scissors. Some surgeons get practice with the robot with virtual reality. They can perform virtual surgeries to get practice using the controller in a safe way.

Robotic Surgeon Interview

We had an interview on September 27th with Dr. Rodriguez, a Robotic Surgeon at Coral Gables and we learned that surgery has changed over time in several ways. One way is that it used to take many days for the patient to recover from surgery and they had to stay in the hospital for longer, but now the robotic surgeries cost less and are more precise. Instead of having a slow painful cut down your body, the robotic surgeon makes a quick, precise incision and surgery is less painful. Since the incision is more precise, the patient can recover faster and leave the hospital earlier. Also, it is less expensive because it is more programmed than traditional surgery so only one surgeon needs to be in the operating room at a time. These changes save money both for the hospital and the patient.



Robotic Surgery Summary

Robotic surgeries are surgical procedures that are performed using robotics. Compared to traditional open surgeries, robotic surgeries need only small openings instead of cutting the patient open. Robotic assisted surgery reduces trauma, bleeding, and downtime for patients, and helps surgeons operate with higher precision.

According to www.cbnc.com 's "**Robots Can Help Doctors Perform Heart Surgery**", surgeons use one of 2 methods for moving the instruments. The first involved using a direct tele-manipulator (a remote manipulator) which allows the surgeon to perform the normal movements associated with the surgery. The second is through computer controls. In this case, the surgeon uses a computer to control the robotics arms.

Robotic surgery can be used in heart, thoracic, gastrointestinal, gynecology, urology, bone, spine, and transplant surgeries.

Past History Of Robotic Surgery

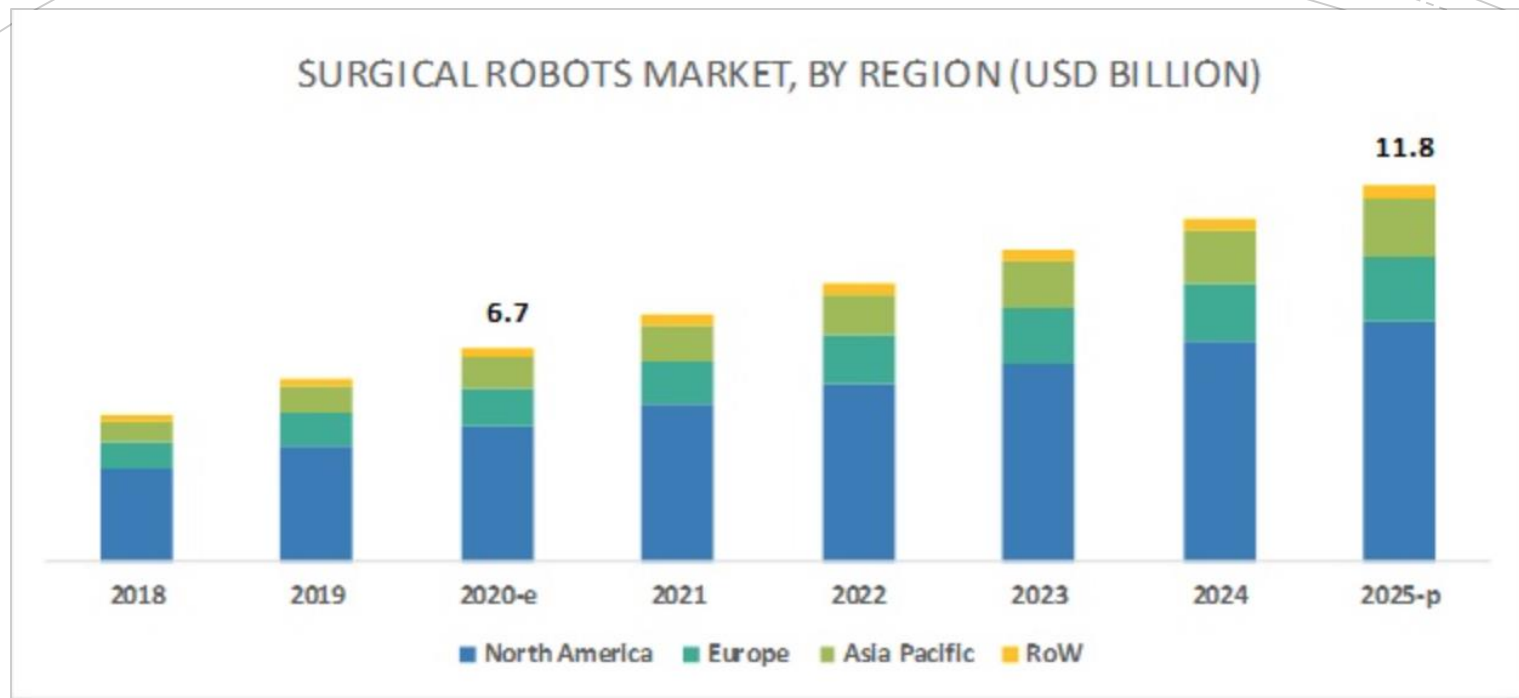
In the past, open surgery was limited by access to the surgical area, long recovery time, long hours of operation, blood loss, scars and marks on the skin.

Robots have allowed surgeons to work with more precision, smaller incisions, decreased blood loss, less pain, and less healing time.

In addition, robots give the surgeon a better view of the surgical site, they allow the doctor to sit during the surgery so they don't get tired as easily, and the computer software can eliminate any small hand tremors.

This information was found at tricitymed.org

Increasing Popularity of Robotic Surgery



<https://www.marketsandmarkets.com/Market-Reports/surgical-robots-market-256618532.html>

This graph explains the past, present, and future of robotic assisted surgery popularity. It explains how the technology will advance and improve robotic assisted surgery. Then more people will invest in it because its futuristic, has many advances, and is cheaper.

Present Robotic Surgery

Robotically assisted technology offers potential advantages that include improved solid vision, wristed tools that improve surgeon skills, and shiver canceling operating systems that improve surgical perfection. These technological moves may allow the surgeon to carry out thorough surgeries in difficult patients. It is also important to mention that the Davinci Robot might be shortening hospital stays for patients who have surgery. This is extremely helpful, especially now with our current situation by making hospital rooms more available

According to davincisurgery.com, we found that even though robotic surgery has been around for about 20 years, there still is not one standard program for learning and becoming experts in using the robots for surgery. This makes it difficult to know “who can” instead of “who really should” be using the popular robot-assisted surgery. Just because you can drive a robot, doesn’t mean you should be doing robotic surgeries. It’s important to mention that today, there is still no standardized training curriculum or credentialing policy for robotic assisted surgery.

Future of Robotic Surgery

We expect from what we have learned in our interview we had with robotic surgeon Dr. Rodriguez that in the future there will be more detailed programming for surgical robots because the technology will be more popular and advanced.

In the future, surgeons may be able to invent new ways to control the surgical robots because our generation will have been around a lot more complicated gaming systems than prior generations of surgeons. As it becomes more popular, the number of companies developing robotic surgery equipment and techniques will grow so they will need a lot more people that have experience working in teams and that have good hand-eye coordination for building.

This is a picture of a doctor controlling a surgical robot. In our interview, Dr. Rodriguez said that in the next 10 years all we be automated, and we will rarely see this method.

Picture source: www.wired.com/2015/03/google-robot-surgery/.





DaVinci

Da Vinci surgery is one of the types of robotic assisted surgery. Da Vinci surgery was released in 1999 as the first robotic assisted surgery where the robot has full control and has the intelligence of a doctor. According to www.davincisurgery.com the surgery was name after Leonardo Da Vinci because he studied human anatomy before his art career.

This picture is one of the designs of the Da Vinci Robot from www.davincisurgery.com

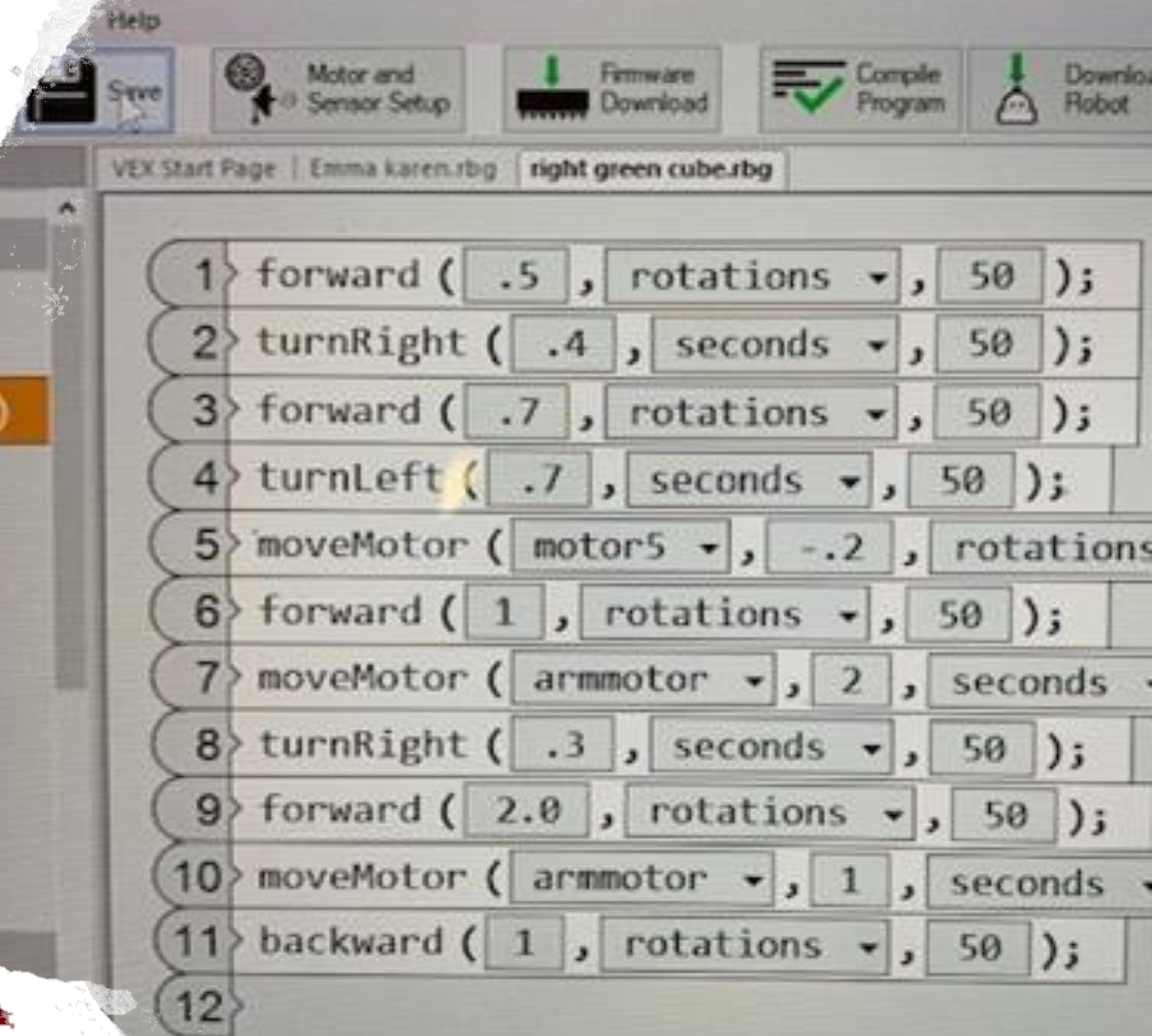
Programming

Robotic Surgeons Use Programming Skills

Robotic surgeons don't program the robots themselves, but they do need to be knowledgeable about how to use the software in the robot. Surgeons must go for special training to learn how to use the software in order to properly operate the robot.

6855A Uses Programming Skills

We use programming skills to connect the robot to the controls so it can help us get the points we need. We use programming skills in autonomous so the robot can collect points on its own.



The screenshot shows the VEX programming software interface. At the top, there are several buttons: 'Help', 'Save', 'Motor and Sensor Setup', 'Firmware Download', 'Complete Program', and 'Download Robot'. Below these buttons, there are tabs for 'VEX Start Page', 'Emma karen.rbg', and 'right green cube.rbg'. The main area displays a sequence of 12 code blocks, each with a line number and a function call. The code blocks are:

```
1 forward ( .5 , rotations , 50 );
2 turnRight ( .4 , seconds , 50 );
3 forward ( .7 , rotations , 50 );
4 turnLeft ( .7 , seconds , 50 );
5 moveMotor ( motor5 , -.2 , rotations
6 forward ( 1 , rotations , 50 );
7 moveMotor ( armmotor , 2 , seconds
8 turnRight ( .3 , seconds , 50 );
9 forward ( 2.0 , rotations , 50 );
10 moveMotor ( armmotor , 1 , seconds
11 backward ( 1 , rotations , 50 );
12
```




Team Work

In the first picture two of our team members are working together with the alliance team to earn the most amount of points.

In the second picture the surgeons are working together to help the patient and achieve the best outcome.





Troubleshooting

Robotic surgeons use troubleshooting skills to figure out the surgical procedure the patient needs, and what they are going to do to help the patient.

In robotics, we need to constantly troubleshoot our robot to make iterations to maximize the amount of points we can earn. In this picture, Manny is extending the arm so the crates can be stacked easier.



Critical Thinking and Problem Solving

In our interview with Dr. Rodriguez, he told us about how surgeons use critical thinking to decide the best way to approach each surgery. They ask themselves, "Why is this the BEST way to approach this surgery?"

We decide the BEST strategy to collect the amount of points we need to get to the next round. We use critical thinking and problem solving to work as a team to program and drive throughout the competition.

In this picture, our team members are strategizing with the alliance team to decide the best route to earn the most points in a minute.



Progress and Adaptation

Robotic Surgeons

Robotic surgeons adapt by practicing and training for every new robot technology that comes out for their surgery.

This helps them make progress as surgeons by becoming more skilled and successful with their surgical procedures.

Team 6855A

Competitive robotics requires us to adapt to a new game each year with a totally new challenge that requires us to build, program, and drive a new robot. Each game helps us improve our skills.

We also adapt by switching roles in driving, building, and journal writing. Each job helps us learn new skills. We've made progress by getting more points in driving, improving our technique, and creating more thorough journal entries.



Driving

We relate to the robotic surgeon driving the robot on a different level as— every single person on our team knows how to drive a robot since we don't have assigned jobs. Just as the surgeon must practice driving the robot many times, we must practice with our robot many times before a competition.

<https://www.npr.org/2019/06/23/735216904/doctors-learn-the-nuts-and-bolts-of-robotic-surgery>



Why You Would Choose This As Your **STEM** Career

Advantages For Patients:

- 1) Lower Cost
- 2) Less scarring
- 3) Less blood loss

Advantages For Doctors

- 1) The robot burns the tip of the organ so less blood and mess
- 2) More surgeries done so more income
- 3) Less invasive

Picture: www.npr.org/2019/06/23/735216904/doctors-learn-the-nuts-and-bolts-of-robotic-surgery%E2%80%8B.



Citations: Articles and Pictures

“About the DaVinci Surgical System.” *UC Health*, www.uchealth.com/services/robotic-surgery/patient-information/davinci-surgical-system/.

Hodgin, Mary Scott. “Doctors Learn The Nuts And Bolts Of Robotic Surgery.” *NPR*, NPR, 23 June 2019, www.npr.org/2019/06/23/735216904/doctors-learn-the-nuts-and-bolts-of-robotic-surgery%E2%80%8B.

“How It Happens With Da Vinci.” *Davincisurgery.com*, www.davincisurgery.com/.

Moynihan, Tim. “Google Takes on the Challenge of Making Robot Surgery Safer.” *Wired*, Conde Nast, 3 June 2017, www.wired.com/2015/03/google-robot-surgery/.

“≡.” *Robohub*, robohub.org/developing-cost-effective-capable-surgical-robots-with-a-sense-of-touch/.

“San Diego Robotic Surgery Services: Tri-City Medical Center.” *Tri*, 27 July 2020, www.tricitymed.org/medical-services/surgical-services/robotic-surgery/.

Soon, Stella. “Robots Can Help Doctors Perform Heart Surgery Remotely.” *CNBC*, CNBC, 4 Oct. 2019, www.cnbc.com/2019/10/03/robots-can-help-doctors-perform-heart-surgery-remotely.html.

“Surgical Robots Market.” *Market Research Firm*, www.marketsandmarkets.com/Market-Reports/surgical-robots-market-256618532.html.



Robotic Surgeon: Surgeon Of the Future

- Team 6855A Warrior Robotics
- Westminster Christian School, Miami, Florida
- Members: Valentina Rodriguez, Valeria Hernandez, Manny Gonzalez, Karen Izqueirdo, T.J Arner