MINNEAPOLIS — Simulators aren’t just for pilots anymore.

Physicians at the University of Minnesota are using virtual-reality simulators to perfect their surgical techniques in complex cases from enlarged prostates to brain tumors. And they are working with local medical device companies to develop new generations of software to train the next generation of medical students.

It may be the most significant change in surgical training since the early 1900s. The researchers hope to build anatomical models so lifelike that medical residents will get hands-on experience and learn from their mistakes without harming patients, said Dr. Robert M. Sweet. Dr. Sweet is the director of the University’s Medical School Simulation Programs. Medical residents are doctors who have finished medical school and are training in hospitals to get more real-life experience.
Creating Custom Models
As the technology improves, surgeons will be able to use medical imaging devices like MRIs to create custom models of their patients’ diseased organs. They will eventually practice tricky procedures before ever cutting the patient open.

“Have you ever seen a pitcher not warm up before their first pitch, or a musician not warm up before they go on stage? Never!” Sweet said. “Why would a surgeon be any different?”

An added benefit: Simulators collect data that can be used to research surgical techniques and detect common errors. For instance, a 2011 study used a virtual reality trainer for a laparoscopic surgery — a type of surgery that’s done without having to make large cuts. It found a “hangover effect.” Surgeons who had drunk to the point of intoxication the night before an operation had lower levels of performance.

Until simulators came along about 15 years ago, the only way for surgeons to get hands-on experience was to cut into living patients. They had to work under the watchful eye of an older surgeon.

Sweet, 44, said the idea for simulator training came to him as he was learning prostate surgery, during his third year of residency at the University of Washington.

“Being from the video game generation, I thought that there might be a good way to do it with a video game,” he said.

"One-Of-A-Kind"
Sweet dropped by the school’s Human Interface Technology lab and they built one. But early simulators were crude compared to the ones being developed now.

Sweet attributes some of the improvements to information in the University’s “one-of-a-kind” Human Tissues Properties Database.

“When a patient dies, we get consent to harvest little bits of tissue. Not whole organs, just little bits of tissue. And we rapidly run them through tests. Mechanical testing. Electrical testing. Thermal testing. Optical testing. You need to understand the object you’re simulating,” he said.

Yunhe Shen, a professor at the university, is in charge of developing algorithms, or math formulas, that provide users with instant feedback. It mimics what surgeons would feel and see if they were operating on a live patient.

Simulators could play a growing role in doctor training, now that medical residents are limited in the number of hours they can work to avoid fatigue-related errors.

Dr. Travis Pagliara, a third-year resident, said the machines are incredibly real and lifelike.
“I’m moving in every direction of space, whether I twist my wrist, whether I push in, pull back, both hands are doing things separately,” he said. “It’s an actual interaction with my body with what happens on the screen.”

**Building Self-Confidence**

Pagliara, 29, had trained on a simulator before he stepped into the operating room to work under Sweet’s supervision on his first real case of a type of surgery. Normally, Sweet said, first-timers last less than a minute before he has to take over.

“Travis blew me away,” Sweet said, praising Pagliara’s natural skills but adding that the simulator made an important difference.

Travis agreed. “I wouldn’t have lasted 15 seconds if I hadn’t done that,” he said.

Residents in neurosurgery, or brain surgery, get to train on a simulator called NeuroTouch Cranio. It was developed for surgeons to practice with a device that uses sound waves to liquefy brain tumors and then sucks away the debris.

“They have more self-confidence and maybe more importantly, they learn their own limitations,” said David Hananel, who helps run the medical school’s simulation programs. “We actually are trying to teach them the errors, the mistakes, the things that shouldn’t be done. Let them do it, see the consequences, and then show them how to recover.”

Dr. Daniel Guillaume, a neurosurgeon and professor at the university, said the 3-D graphics in NeuroTouch visually mimic what surgeons see in the operating room. The physical feedback is very good, so tumors feel different from brain tissue, he said.

“Before this kind of thing came along, the only way to teach people to operate was in the operating room on a human who’s alive, because cadavers don’t have the same tissue property,” Guillaume said. “So this is actually better than a cadaver and it’s safer than operating on a patient.”

1. Why does the author most likely place the words “one of a kind” in quotations?
   
   a. It outlines the main reason for having virtual surgery devices
   b. The author wants these words to stand out
   c. This is a commonly used phrase so the reader should not take the meaning literally

2. Which statement best identifies the author’s premise in “Operating on a brain tumor in a 3-D video game made for surgeons”?
   
   a. Simulators are helping to save more lives
   b. Simulators are not realistic
   c. Simulators are helpful to train new doctors in a safe way
3. Read the following sentence. Then answer the sentence that follows.

But early simulators were **crude** compared to the ones being developed today.

What is the meaning of **crude** as it is used in this text?

   a. mean
   b. in a raw state
   c. vulgar or obscene

4. Based on the article how do you think the author feels about virtual reality simulators in medicine? Explain AND cite one quote that supports your argument.

5. Read the following section of the text and answer the following question.

    Pagliara, 29, had trained on a simulator before he stepped into the operating room to work under Sweet’s supervision on his first real case of a type of surgery. Normally, Sweet said, first-timers last less than a minute before he has to take over.

    “Travis blew me away,” Sweet said, praising Pagliara’s natural skills but adding that the simulator made an important difference.

    Travis agreed. “I wouldn’t have lasted 15 seconds if I hadn’t done that,” he said.

    Residents in neurosurgery, or brain surgery, get to train on a simulator called NeuroTouch Cranio. It was developed for surgeons to practice with a device that uses sound waves to liquefy brain tumors and then sucks away the debris.

   Why do you think the author included this passage in the text? Is this passage and example of ethos, pathos, or logos?