I t's a fair bet most patients want their surgeons comfortable and happy when the cutting starts.

Unfortunately, surgeons who use laparoscopic surgery techniques are often just the opposite. They're forced to work with long, awkward instruments while viewing fish-eye video images from a small camera, all of which lead to repetitive stress injuries.

Sac State professor Warren Smith is trying to help. Laparoscopic surgery, which involves smaller incisions than traditional surgery, is wonderful as far as patient recovery goes. So Smith is focused on making the operations less taxing for the surgeons.

For the last six years, he and student assistants have been perfecting a computer-controlled "Ergonomic Workstation" to monitor surgeons' mental and physical stress. They're trying to identify where the worst stress occurs so improvements can be made. And now Yale University researchers, who are working in the same area, have purchased the system for their own studies.

"This is a huge issue for surgeons," Smith says. "Hopefully, research using this system will help companies develop better instruments, and help hospitals develop better operating rooms and procedures."

It isn't simple—or inexpensive—to turn an eager student into a surgeon. They usually spend at least nine years in training after earning their four-year college degrees, according to the American Medical Association. The longer they can extend their career after that, the better.

Smith got started after talking with Martinez surgeon Ramon Berguer, who was concerned about the number of surgeons suffering from injuries such as carpal tunnel syndrome, sore backs and shoulders, and loss of feeling in their fingers.

Smith and his students introduced their first monitoring system five years ago at a medical conference in San Diego. Volunteer surgeons were wired to the computer, which then measured muscle movement while they performed various tasks with surgical instruments.

"The surgeons were very interested," Smith says. "One after another they would tell us about pains in their shoulder or thumbs going numb, all related to the use of their instruments. Here were these doctors asking us engineers if we could help with medical problems."

After years of improvements, the latest system is much more sophisticated. It now measures muscle movement, brain waves, hand sweat, heart rate, and the angle of arms and head.

The system is now wireless, which made wearing it much more comfortable for surgeons. A very small computer is worn in a belt pouch and sends signals to the main laptop computer. It doesn't interfere with surgery, so Yale University has been able to use it to monitor surgeons in operations on human patients. It also works with a multi-camera system, so researchers can record what the surgeon was doing when physical and mental stress levels changed.