



EMBRACING TECHNOLOGY

to improve health-care
quality and access

The town has about 10 streets. It has one gas station but no fire department and no police department.

About the cover photo

Portable satellite terminals are enabling UC Davis practitioners to reach patients and health care providers in small communities throughout the state who need access to specialized medical care and education. Without the high-speed connectivity of the portable satellite terminal, rural patients would need to travel significant distances for specialty care.

Produced by the Department of Public Affairs, UC Davis Health System

The San Joaquin Health Center in San Joaquin City is staffed by three family physicians and a family nurse practitioner student, but clinicians and patients alike suffer from the community's isolation.

Much of the population, primarily farm workers who toil long hours in the sun, could benefit from the expertise of a dermatologist. But patients with potentially serious health problems like skin cancer have no medical specialists nearby. The closest hospital is 45 miles away in Fresno, with waits for appointments of up to six months. In addition, many farm workers lack reliable transportation and have to seek help from family members or friends willing to skip a day's work — and wages.

"These are patients who basically go untreated," said Husam Kaileh, medical director of the San Joaquin Health Center.

To help such communities, UC Davis Medical Center is piloting the same portable satellite technology that journalists use to broadcast reports live from remote regions of the world. Instead of dispatches from the battlefield, UC Davis physicians will study

the technology as a way to deliver specialty care and education to patients and their physicians who reside in areas of the state that are geographically remote and/or lack the broad-band infrastructure to support traditional telemedicine services.

The portable satellite terminal bypasses the need for land-based telecommunication lines, making a direct connection to a satellite which allows UC Davis specialists to communicate with patients and their physicians in their own community. The system transmits real-time, two-way video and can be set up and fully operational within 15 minutes.

The satellite study, funded by the California Telemedicine and eHealth Center and The California Endowment, is just one example of how the school and medical center are exploring innovative, high-tech solutions to improve patient care and to enhance the training of physicians, nurses,

See "technology" inside

UCDAVIS
HEALTH SYSTEM

Enhancing education with patient simulators

The UC Davis Center for Virtual Care is at the forefront of a national trend in medical education that's using patient simulation technology to supplement the traditional medical education.

Employing some of the same technology used in flight simulators, the center features high-tech simulation systems that allow physicians, nurses and other clinicians to develop critical thinking skills and experience a variety of medical scenarios in a realistic environment. The simulators produce a unique outcome depending on the actions and responses of each user. As a result, they are a useful addition that enables students to practice new medical procedures and try new devices without risking harm to actual patients.

The center's patient-simulation systems use mannequins like Standard Man, or Stan, that can be injected, intubated and catheterized. Stan has a pulse, normal and abnormal breath and heart sounds, pupils sensitive to a flashlight and an airway that swells if he is exposed to a medication to which he is allergic. "Simantha," a second simulator, can be programmed with blockages in the coronary, renal, iliac and carotid arteries. Advanced scenarios help users handle patients with unusual vascular anatomy or an unexpected reaction to a drug.

David Dawson, associate professor and chief of vascular surgery, is a former U.S. Air Force

Students practice checking pupils for response to light



flight surgeon who has used advanced flight simulators for jet trainers, flight aircraft and the space shuttle.

"The way we treat patients has changed," Dawson said. "Until recently, we had conventional tools for surgery. Now our interventions are almost like a video game — our eyes and hands are removed from what we're actually doing. Doctors need to develop a new skill set that is image-driven."

During a simulated procedure, a user responds to conditions and responses he or she would encounter during an actual case. For example, when clearing blocked arteries, the

user advances a catheter through the patient's anatomy while watching the progress on a video monitor with a real-time X-ray image. After the procedure, the user receives an assessment of how he or she performed.

Simulation practice is meant to supplement, not replace traditional medical training. Even so, preliminary evaluations show encouraging results, with students completing procedures faster and with fewer errors after simulation training. In addition, a growing body of evidence suggests that the use of simulators can improve patient outcomes while providing a means for physicians to test and hone their skills.

technology (from front page)

students and other health-care providers.

"As the northernmost academic medical center in California, we have taken responsibility for improving the practice of medicine in our immediate area, as well as in rural communities from the San Joaquin Valley

to the Oregon border," said Robert E. Chason, chief executive officer of UC Davis Medical Center.

"Technology is transforming the practice of medicine at UC Davis in many

ways. It's enabling patients linked to our telehealth program to receive care in their own communities. It's giving physicians new tools to finetune minimally invasive surgeries using robotics. It's enabling physicians with expertise in medical informatics to direct the conversion of paper-based patient charts and data to a fully integrated and advanced electronic medical record and alerting system. And it's creating a virtual hospital where students and teams of physicians and nurses can practice new procedures and assess their skills on patient simulation systems."

From its first telemedicine project in 1992 linking doctors at Colusa Community Hospital to obstetric specialists at UC Davis Medical Center, the UC Davis Telehealth Program has grown to serve more than 60 primary-care clinics, hospitals, home-health agencies and county facilities throughout California. The telehealth program ranks among the top 10 such programs in the nation, and its educational arm, the Telemedicine Learning Center, is widely recognized as the most successful program of its kind. Thanks to telemedicine services at UC Davis Medical Center, many high-risk pregnant women have been able to deliver their babies in their own home towns, acutely ill and injured children have been able to avoid transport to Sacramento

and patients with challenging or rare conditions have been able to consult with specialists without a long trip to an academic medical center.

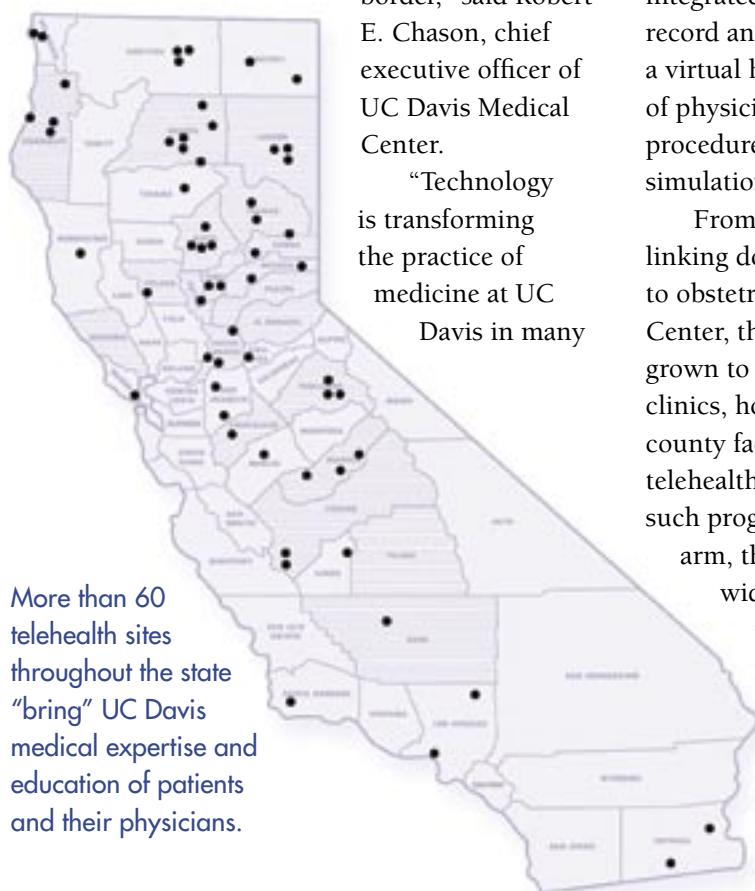
By capitalizing on advances in medicine and technology, UC Davis Health System continues to transform health care delivery in California. Here are some of the latest developments:

Surgical Robots

For many people, robots still may conjure memories of the metallic family servant in the 60s television series "Lost in Space." But today's surgical robots are more than high-tech oddities. They are extending a surgeon's capabilities, allowing for finer control of movement, better accuracy and greater flexibility.

At UC Davis Medical Center, surgeon Mohamed Ali, director of minimally invasive surgery, has performed more robotic-assisted gastric bypass surgeries than anyone else in the world. During the process, he wears 3-D glasses and sits in a chair equipped with movable arms attached to joysticks. And the patient he's operating on is across the room.

Instead of wielding a scalpel, Ali speaks into a microphone as he watches a TV screen above his head. He issues commands to "move in," "stop" or "move right" to a voice-activated computer that controls a laparoscope. He operates joysticks that control movements of robotic arms wired to devices such as suturing needles.



More than 60 telehealth sites throughout the state "bring" UC Davis medical expertise and education of patients and their physicians.

for the 21st century

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The joysticks filter out hand tremor, allowing for better accuracy. A movable “wrist” provides an additional plane of rotation, permitting greater flexibility, especially important in tight quarters.

“There are angles that you can negotiate only with the robot,” said Ali.

In the future, surgical robots could combine with telemedicine to allow doctors to perform surgeries on patients who are located miles away.

Electronic medical records

Paper charts and X-rays are icons of the medical world, but at UC Davis Medical Center, they’re on their way to becoming historical artifacts.



X-rays and other radiological images on film are already obsolete in the UC Davis Health System. Last year, the medical center and its clinics switched to a system that stores all radiological images in a digital format and makes them available for online viewing on computers throughout the health system. Paper medical records will be the next to go this April, at the primary care network clinic in Folsom followed by the hospital and other clinics over the next year.

The switch to a digital format represents an immense improvement in patient care. One of the glaring limitations of paper charts and images on film is that they can be in only one place at a time. They also can be misplaced, lost or forgotten. Storing records and images digitally not only eliminates those drawbacks, it makes possible greater flexibility and wider applications.

Stored electronically, patient records may be viewed in different locations by multiple people at the same time. With approved access, doctors may even view a patient’s EMR from home

computers. With film development unnecessary, doctors can discuss radiological images with their patients immediately.

Eventually, a patient’s digital radiological images will become a part of his or her electronic medical record (EMR). The EMR conversion, scheduled for completion in 2007, is a massive undertaking and will contain all of the same information as a paper record, but store it electronically, on a computer. The EMR is the main component of plans to develop a clinical information system that provides practitioners with a single source of patient data available anytime, anywhere, using computers located wherever patients are served.

The transformation will do more than just provide greater convenience and eliminate the 8 1/2 feet of paper charts generated by the hospital and its clinics every day. The EMR also will improve patient care and safety through different features built in to the system. For example, it will help reduce medication errors via an automated checking of potential drug interactions.

Web messaging

UC Davis Medical Group is one of the few medical groups in the country to offer its patients and doctors the option of communicating by way of a special messaging system on the Web. In the more than two years since the system first became available, doctors report that it has made it easier for them to communicate with patients, while patients say that it has improved service.

The messaging system enables patients to conduct a “visit” to request an online consultation, ask questions, renew prescriptions or schedule appointments. Doctors may dispense advice, answer questions, provide patient-education messages or send laboratory results. And they can do it at any time, from any place.

Patients may compose their own message, take part in an interactive questioning process that includes a list of common symptoms and conditions, or do both. The system is designed

to handle questions and low-level, non-urgent conditions. If a doctor determines that a message reflects a more serious condition and requires an office visit, then he or she will send that advice to the patient.

Early warning system

A pioneering, Web-based system designed to improve patient safety by quickly pinpointing opportunities for improvement in patient care — now in place at all University of California medical centers — was developed at UC Davis Medical Center.

The Incident Reporting System allows frontline medical workers to quickly report on adverse and “near-miss” medical events from most computers in a UC medical center. It permits early identification of trends and patterns of medical incidents. Once such patterns are identified, steps can be taken to improve patient safety. Regular reports generated by the system are available to designated physicians, nurses, pharmacists, quality managers, risk managers and administrators.

Although hospitals have had incident reporting systems of varying sophistication for years, the UC system is the first of its kind in the nation to link academic medical centers on a systemwide basis through the Internet, with provision for monthly conferences to address findings. The system includes built-in electronic safeguards to protect medical and patient confidentiality.

In 1999, UC Davis Medical Center independently developed the incident-reporting system, and it drew the attention of medical directors at other UC hospitals, who decided to adopt it throughout the UC system. Also in 1999, the Institute of Medicine issued a landmark report, “To Err is Human,” which highlighted the importance of identifying and learning from errors and unsafe situations. The report called for the establishment of event-reporting systems to not only learn about errors, but to correct hazardous conditions — before they affect patients.



Fostering bench-to-bedside research

Along with its record of innovation and discovery in health-care delivery, the UC Davis School of Medicine is building a national reputation for its basic science and clinical research investigations and for its strong emphasis on translational research, which aims to move new findings from the bench to the bedside as rapidly as possible.

In just the past five years, outside funding for research in the School of Medicine has nearly doubled, from \$53.6 million for the fiscal year 1998-99 to \$102 million for the current fiscal year. More than 550 grant-funded research studies are currently under way within the school, with particular focus in bone biology, cancer biology, epidemiology, human molecular genetics, infectious diseases, neurosciences and vascular biology.

The number of research projects and grants continues to rise, as interdisciplinary collaborations grow among School of Medicine researchers and investigators in campus schools and units such as the California Regional Primate Research Center, School of Veterinary Medicine, Division of Biological Sciences, College of Agricultural and Environmental Sciences and College of Engineering.

The School of Medicine also has vigorous and growing research collaborations with outside organizations such as the Shriners Hospital for Children Northern California, the Veterans Affairs Health System, the USDA Western Human Nutrition Research Center and Lawrence Livermore National Laboratory.

With its long history of fostering collaborative research, the school of medicine

UC Davis experts in infectious diseases are among the nation's leaders in HIV and AIDS research, as well as public health and emergency preparedness.



is well-positioned to take advantage of the growing realization within the scientific community that no one discipline, working alone, is likely to solve the puzzle of complex diseases like cancer, autism or AIDS.

Some recent research highlights:

☉ Physicians and researchers in the [Laboratory for Atherosclerosis and Metabolic Research](#) are at the forefront of understanding the molecular mechanisms associated with cholesterol build up at the blood vessel wall and are active in evaluating new cholesterol-lowering therapies. In February, they published research that showed plant sterols added to orange juice



effectively lowers low-density lipoprotein, or “bad” cholesterol” levels, in individuals with mildly elevated cholesterol levels.

☉ In February, physicians in the [Department of Psychiatry](#) published a report in the journal *Science* showing how circuits in the frontal lobe of the brain work together to keep attention on track and minimize errors, a finding that could hold keys to a better understanding of attention disorders.

☉ In January, a team of researchers led by physicians at the [UC Davis M.I.N.D. Institute](#) published the discovery of a new, progressive neurological disorder that causes tremors, balance problems and dementia in older men with a premutation of the fragile X gene. M.I.N.D. Institute investigators have also identified and focused public attention on a dramatic increase in autism cases in California.

☉ In November, [UC Davis Cancer Center](#) hosted the 24th Congress of the International Association for Breast Cancer Researchers, bringing together 400 breast cancer investigators from around the world in an exploration of mouse models of human breast cancer. The meeting showcased UC Davis work in mammary stem cell research and breast cancer genetics.

☉ This spring a new facility will be built to house research at the [Center for Biophotonics Science and Technology](#). One of only 25 special science and technology programs in the nation funded by the National Science Foundation, the center is devoted to the study of light and radiant energy in biology and medicine.

☉ Since becoming the [nation's 61st National Cancer Institute-designated center](#) in July 2002, the [UC Davis Cancer Center](#) has seen its cancer research program more than triple, from \$14 million to \$46 million. And last year, for the second year in a row, its clinical research program ranked first among the 283 research institutions in the Southwest Oncology Group for the number of patients enrolled in cancer clinical trials.

Did You Know?

UC Davis School of Medicine and Medical Center:

- ☉ Is based in Sacramento on a 140-acre campus that was previously the county fairgrounds.
- ☉ Is a leading referral center in the region for the most seriously injured or ill patients, and the most medically complex cases, covering 33 counties, more than 50,000 square miles and over 5 million residents
- ☉ Is Northern California's only level I trauma center and comprehensive adult and pediatric emergency departments in the region that has kept the preventable death rate in Sacramento County at or below 1 percent, well below the national average of 2 to 5 percent.
- ☉ Is home to inland Northern California's only Regional Burn Center.
- ☉ Is among the few hospitals in the nation with an all-R.N. staff, with many nurses holding advanced degrees and specialty certification.
- ☉ Provides more health care to the uninsured — \$147 million annually — than any other hospital in the region.
- ☉ Provides five free community clinics for medically under served populations, including Asians, Latinos, Muslims, African-Americans, and intravenous drug users and their families.
- ☉ Trained more than half the physicians who currently practicing in the Sacramento area practice, general pediatrics or internal medicine, and 80 percent train in California.