Introducing CASIT
by E. Carmack Holmes, M.D.
Executive Director

CASIT, The Center for Advanced Surgical and Interventional Technology, was conceived following the 1994 earthquake when it was necessary to build a replacement hospital for UCLA. Our task was to design the 21st century operating rooms. Pioneering computer scientist Alan Kay said, “The best way to predict the future is to invent it.” Thus inspired, the idea emerged to create a center as an on-going hub for research and education of surgical technologies.

Important partners were departments of the school of engineering, mathematics, cognitive psychology, education, and industry.

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Health System Board

UCLA Health Board visits CASIT. Drs. Mazziotta and Atkinson demonstrate.

Telehealth

In December 2015, CASIT was accredited as a Comprehensive Accredited Education Institute by the American College of Surgeons, under the leadership of Dr. Areti Tillou. Continued on Page 4.

“Congratulations to you and the crackerjack team you have running CASIT and to Dr. Tillou in particular for her work in this area. It’s a model for all of us.” - Dr. Mark Litwin, Chair, Urology

The MAVEN Project mission is to address unmet healthcare needs of underserved U.S. populations seeking services at safety net clinics. Dr. Abie Mendelsohn is using CASIT telehealth technology to provide consultations to patients at remote MAVEN sites.

www.mavenproject.org
Executive Committee

E. Carmack Holmes, MD  
Executive Director

Erik Dutson, MD  
Executive Medical Director

Greg Carmen, PhD  
Executive Engineering Director

Warren Grundfest, MD  
Graduate Engineering Education Director

Cheryl Hein, MS  
Managing Director

O. Joe Hines, MD  
Chief, General Surgery

Abie Mendelsohn, MD  
Chair, FPG Robotic Subcommittee

Jacob Rosen, PhD  
Director of Surgical Robotics Engineering

Areti Tillou, MD  
CASIT AEI Center and Surgical Director

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EDUCATION

UCLA Aortic Center Symposium

Dr. William Quinones-Baldrich,  
Course Director

Attendees improved endovascular repair skills utilizing simulators of infrarenal abdominal aortic aneurysm and thoracic aneurysm cases supported by endograft manufacturers.

Robotic Surgery Skills

In April 2015 and October 2015 we established the inaugural Robotic Surgery Intensive courses for residents at UCLA and in the local community. More than 200 residents from Gynecology, Head and Neck, Cardiothoracic Surgery, Urology, and General Surgery participated in combinations of lectures, demonstrations, simulator labs, dry labs, bedside skills training, and cadaveric wet labs. Pilot programs for OR nurses and bedside skills trainer sessions were also launched. The training took place in the CASIT lab in RRUCLA and in the Surgical Science Laboratory in CHS.

A big thanks go to these faculty contributors and departments: Surgery: Drs. Areti Tillou, Erik Dutson, Jon King, Tim Donahue; Warwick Peacock, and Grace Chang; Head and Neck Surgery: Drs. Abie Mendelsohn and Vishad Nabili, Urology: Drs. Arnold Chin and Steve Lerner; Gynecology: Drs. Tamara Grisales, Lauren Nathan and Chris Tarnay, Cardiothoracic Surgery: Drs. Jay Lee, Peyman Benharash, Robert Cameron and Jane Yanagawa; Nursing: Christine Pizzulli, Lauren Fujihara Isozaki, and Jasmine Briones.

“Great learning tools; I look forward to going back frequently to improve our skills.” - Dr. Arnold Chin
CLEFT LIP AND PALATE SURGICAL PROCEDURE LAB

Drs. Raquel Ulma and Justine Lee delivered a fully interactive state-of-the-art skills training course in cleft lip and palate repair to residents from the Division of Plastic Surgery within the CASIT main lab.

“It was great to work in CASIT; looking forward to using your space again.”
Dr. Raquel “Rocky” Ulma

RESEARCH

Simulating Surgery for Learning

CASIT researchers are fusing Virtual Reality (VR) simulation with advances in the science of learning to investigate the value of VR simulation for training first responders in the treatment of hemorrhage. Under the leadership of co-PIs Drs. Erik Dutson (Surgery) and Phil Kellman (Psychology), the team has created the first detailed computer simulation of an injured leg—complete with spurting blood—a “breakthrough” model. The multidisciplinary team includes faculty investigators Jeff Eldredge, PhD (Mechanical Engineering/Fluids; tech team lead), Joseph Teran, PhD (Mathematics), Anand Santhanam, PhD (Radiation Oncology/Computer Science), and Peyman Benharash, MD (Cardiovascular Surgery.)

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New Awards

Image Fusion for Prostate Cancer

Congratulations to Drs. Leonard Marks and Allan Pantuck and their team of investigators for two research awards, “Prospective Assessment of Image Registration for the Diagnosis of Prostate Cancer (NIH award), and “Focal Laser Ablation of Prostate Cancer: A Pilot Feasibility Study Using MRI/US Image Fusion for Guidance” (Medtronic. Award.)

Left: Interstitial probe temperatures during FLA treatment. Right: Post-treatment dynamic contrast-enhancement image showing treated region as non-perfused.
New Awards, cont.

Team Training

Congratulations to Dr. Randy Steadman and his multidisciplinary team from Anesthesiology, Surgery, the School of Education, CRESST, and CASIT for their multi-year US Army award for “Design of a Screen-Based Simulation for Training and Automated Assessment of Teamwork Skills.”

Virtual Tissue

Congratulations to Dr. Peyman Benharash and his multidisciplinary team from Surgery, Mathematics, Mechanical Engineering, Electrical Engineering, Bioengineering, and CASIT for a 3-year, $3.6M award for “Virtual Tissue Modeling for Real-time Surgical and Interventional Procedure Simulation.”

Best Paper

Congratulations to Dr. Zachary Taylor and his co-authors for receiving the annual best paper award from IEEE Transactions on Terahertz Science & Technology for their paper entitled, “THz and mm-Wave Sensing of Corneal Tissue Water Content: Electromagnetic Modeling and Analysis”. The award will be presented to Dr. Taylor at the upcoming May 2016 IEEE MTT-S International Microwave Symposium Awards Banquet.

ACCREDITED EDUCATION INSTITUTE

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These institutes are dedicated to advancing surgical training and patient safety through the use of simulation and other evidence-based methods; to develop technologies, identify best practices, advance scholarship, and promote research and collaboration among the institutes. The institute will be known as the CASIT AEI at UCLA. Collaborating partners include the UCLA Simulation Center under Dr. Randy Steadman in Anesthesiology, the Surgical Science Laboratory under Dr. Warwick Peacock in Surgery, and DLAM under Dr. Cristobal Torres.

Vice Chair of Education, Dr. Areti Tillou, has been named Center and Surgical director of the institute. She and her team completed the application process and conducted the recent site visit by the American College of Surgeons. Team members Cheryl Hein, Chi Quach, Alan Edwards, and Jonathan Chrin, as well as Drs. Joe Hines, Erik Dutson, Jonathan King, David Chen, Peyman Benharash, and Jeff Eldredge, supported the application.

INTRODUCING CASIT

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Crucial institutional support was provided by Alan Robinson, Gerald Levey, John Mazziotta, and David Feinberg. Pivotal philanthropic support for the CASIT vision was generously provided by the Gonda Family Foundation, the Jean Perkins Foundation, the Rothman Family and the Wundrman Family Foundation. Major program support for renovation of the CASIT center and for research and education was received from the Telemedicine and Advanced Technology Research Center (TATRC) of the US Army.

The new CASIT center in the Ronald Reagan UCLA hospital provides an environment where surgeons and trainees can practice or rehearse operations virtually using advanced surgical simulators, including a rich set of performance measures.

This is analogous to flight simulation training of commercial airline pilots. Studies have shown that pre-operative rehearsal improves performance. Surgeons in training from all surgical specialties can hone skills and practice low-incidence, high risk procedures safely.

New Telehealth infrastructure in the center allows our surgeons to be “telepresent” in remote clinical settings, including the operating room. They can provide clinical care and instruction at a distance.

CASIT is now well-established as a multidisciplinary research, education and telehealth program for the surgical sciences. Come and visit!
Simulating Surgery for Learning

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A press release was published in February 2016 by the Office of Naval Research and the following article was published on March 28, 2016 in the Stars and Stripes newspaper:

Simulated leg wounds could provide medics better training for real thing

By Wyatt Olson
Stars and Stripes

On-the-job training for military medics comes at a high cost.
The trauma they see downrange often requires split-second decisions that could mean life or death for a wounded warrior.

To better prepare medics for these real-life situations, researchers at UCLA have created a prototype model computer simulation of a leg bleeding from a puncture wound, such as from shrapnel or a gunshot.

The goal is to give field medics initial training on an “anatomically, physically and mathematically accurate model” of various leg wounds, said Dr. Erik Dutson, a surgeon and executive medical director of UCLA’s Center for Advanced Surgical and Interventional Technology. The work is sponsored by the Office of Naval Research.

The researchers were driven in part by the Pentagon’s announcement a few years ago that, starting in 2015, the military would curtail the use of live animals for combat trauma training, a practice long decried by activists. The Pentagon called for the use of more — and improved — simulations for training.

Injury simulations have been around for more than 15 years, Dutson said, but they have been relatively unsophisticated, offering images and movements that didn’t factor in the myriad functions of a wounded body — blood pressure, shock, heart rate and the nature of blood spillage and coagulation.

But the center’s researchers have painstakingly developed algorithms based on data from 3D coordinates, CAT scans and MRIs to re-create a virtual wounded leg.

“We’ve used physics-based mathematics and fluid dynamics to actually illustrate what would happen if there were various projectile or blast injuries to the leg,” Dutson said.

Previous simulations were created as “the best estimate” of how a wound appears, he said.

“When you look at the virtual work that’s been done up until now, it’s not based on actual CAT scans or MRIs or actual anatomy,” he said. “It’s based on a cartoon.

“But in those cases there’s never any bleeding during surgery or any problem. The representation of bleeding was not truly based on how fluid actually acts, not taking into account the human circulatory system, not taking into account the various pressure heads of different sides of arteries, arterials and veins. We’ve managed to combine all of that. It’s probably as accurate as you can get for this type of work so far.”

For years, military medics have had to use lifelike dummies to train for battlefield limb injuries. Now, researchers at UCLA are developing a computer simulation of a leg bleeding from a puncture wound, such as from shrapnel or a gunshot that they hope will provide more realistic training.

The researchers began with a simulation of the leg for practical reasons. First, they’d already crunched data for previous projects on the leg, so they had a head start. Second, limb wounds have been the scourge of American troops in the past 15 years. Through 2014, 1,645 troops had suffered a major limb amputation as a result of a battlefield injury, according to the Defense Department.

“We figured that this was a good starting point because of the pattern of injuries coming back from Iraq and
Afghanistan,” Dutson said. “They’re getting hit by improvised explosive devices.

“The last two major conflicts have seen an enormous rate of amputations and traumatic injuries due to extremity injuries. That’s because the torso and head tend to be well-padded, but extremities are not. These are people who would have died in the old days, for sure, but they still end up losing limbs because of blood loss and tissue damage.”

Dr. Ray Perez, a program officer in ONR’s Warfighter Performance Department, pointed out a third reason.

“Leg injuries are particularly difficult to treat since different points of entry cause different levels of blood loss,” he said in a Navy news release.

The new simulation can accurately mimic those variations. A penetrating leg wound with entry and exit points can be something that’s simply painful or it can be a life-threatening hemorrhage, Dutson said.

“A medic is not necessarily going to appreciate what they’re faced with by looking at a hole in the skin,” he said. “We have the opportunity to give them the entire spectrum of experience based on the outside looking like it’s not something serious at all.”

The simulation can be easily manipulated to create an array of wounds, some of which a working field medic might not see so often and thus not be prepared to treat.

The simulation is interactive, with a learner facing various scenarios. At each step, a decision is required, “sort of a multiple choice test based on high-fidelity visual imagery and a change of scenario of vital signs and circumstances,” Dutson said. “The whole thing keeps changing, and they have to go from scenario to scenario to scenario.”

The researchers have gotten some negative comments from specialists in the field of trauma who’ve looked at video of the prototype simulation and said, “This doesn’t look real to me,” he said.

A still clip taken from a computer simulation of a leg wound designed by the Center for Advanced Surgical and Interventional Technology at the University of California, Los Angeles. The goal of the simulation is to give field medics initial training on an anatomically, physically and mathematically accurate model of various leg wounds. Courtesy of UCLA

The finished simulation, Dutson said, will create that reality by depicting “blood as the true tissue it is.”

“Blood has a gazillion different cells in it,” he said. “It has a very sophisticated coagulation cascade that involves 12 or 13 steps anytime there’s any type of injury. What we’ve been simulating so far has basically been something that has the molecular density of blood but it’s an inert fluid as opposed to blood, which is a living tissue. So we want to incorporate the coagulation factors and the altering natures of blood in the next go around. At that point, it will be very hard to distinguish the simulation from an actual injury.”

The researchers are ready to move onto that final phase of the simulation.

“Ideally, what we’d like to do is get this in the hands of experienced field medics and some trainee field medics,” he said.

▲ This illustration demonstrates how blood from a severed artery reacts when it hits a barrier. Simulating dynamics such as this are what researchers at the University of California, Los Angeles, say could help new field medics quickly learn about treating various leg wounds. Courtesy of UCLA

Source: http://www.stripes.com/news/simulated-leg-wounds-could-provide-medics-better-training-for-real-thing-1.401119