

Canadian Surgical Technologies and Advanced Robotics

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OVERVIEW

A hub of surgical innovation, Canadian Surgical Technologies and Advanced Robotics (CSTAR) is a leading training facility for multidisciplinary training in minimally invasive surgery and advanced robotics (Fig. 1). CSTAR's mission is to close the gap between "those who know and those who do" in the delivery of minimally invasive surgical care through world-class research, validation, and simulation education. As a program of London Health Sciences Centre (LHSC), CSTAR's research, validation, and simulation education programming aspires to improve clinical practice and patient outcomes, as well as improve patient care.

"CSTAR views simulation as a critical pillar of surgical education which provides a validated and reliable method of training the next generation of surgeons in a safe and effective environment to bring new, and existing surgical technologies to patient care. When integrated into the knowledge translation process this way, CSTAR's simulation education programming provides optimal impact on clinical practice and patient outcomes," says Dr Douglas Ross, Chair, CSTAR Education Committee and Director, Office of Surgical Education, Schulich School of Medicine and Dentistry, The University of Western Ontario.

CSTAR's formal education programming began in 2007 with its accredited Continuing Medical Education (CME) initiative and expansion of its medical student training programs with The Schulich School of Medicine & Dentistry at The University of Western Ontario (Schulich). CSTAR now develops team-based, patient-centered simulation education and training programs that use low- to high-fidelity simulation environments for a broad spectrum of learners. CSTAR received accreditation as an Education Institute of the American College of Surgeons in December 2008.

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LOCATION

Geographic

CSTAR is located in London, Ontario, Canada, which is approximately 150 km southwest of Toronto, Ontario, in the geographic region referred to as Southwestern Ontario. London is Canada's 10th largest city (population: 470,000) with more than 20,000 people employed in health care. Air service is provided by London International Airport with direct connections to Ottawa, Montreal, Toronto, Winnipeg, and Detroit. International connection flights are provided through Toronto Pearson International Airport and Detroit Metropolitan Wayne County Airport.

Within the Institution

CSTAR is a state-of-the-art 22,500 sq ft facility that occupies 3 floors of the Lindros Legacy Research Building and is connected directly to both LHSC and the Schulich medical school. This provides medical students, trainees, surgeons and researchers direct access to CSTAR's facilities and programs. In addition, CSTAR is linked directly to the University of Western Ontario's Animal Care and Veterinary Services, which is a 100,000 sq ft, level 2 animal laboratory facility.

Strengths

Through expertise in many areas, CSTAR develops and facilitates the transfer of new knowledge to educate and train surgeons on the most innovative minimally invasive technologies. CSTAR works closely with the Department of Surgery at the Schulich School of Medicine & Dentistry. Through this partnership, CSTAR develops training programs for students and trainees, and it conducts research into surgical education and simulation. CSTAR also works closely with surgeons and scientists who are renowned international leaders in their fields, and who have a demonstrated commitment to surgical education. As a program at LHSC, CSTAR also works collaboratively with senior hospital leadership, which has identified leadership in simulation education as a key strategic priority for the organization.

CSTAR's strengths lie in its ability to deliver superb quality education programs to students, trainees, practicing sur-



FIGURE 1. The CSTAR, London Health Sciences Centre and University of Western Ontario Campus, London, Ontario, Canada.

geons, and other operating room team members in its state-of-the-art facilities, soon to be enhanced even more. Construction of the Brent and Marilyn Kelman Centre for Advanced Learning has begun. This \$4.5 million, 8000-sq ft simulation training facility scheduled to open in the fall of 2010 will enable CSTAR to offer more advanced simulation education programs.

CSTAR has also established a dedicated simulation education Content Development Team (CDT) composed of people with expertise in curriculum development, veterinary services, information technology, biomedical engineering, communication, marketing, and sales expertise. CSTAR's CDT has developed and is currently refining a replicable content development process for a wide variety of simulation education programming. This templated process has streamlined content development, reduced overall faculty burden of program development, controlled development costs, and substantially improved overall programming quality and learner satisfaction.

In an effort to improve the delivery of education programs continuously, CSTAR has partnered with the Richard Ivey School of Business at The University of Western Ontario. Through this partnership, CSTAR has codeveloped a new customer service satisfaction program to garner valuable feedback from program faculty, participants, and other important stakeholders. Feedback is tracked and used to improve programs on an ongoing basis. This business model of recurring performance measurement and quality improvement has been extremely beneficial to trainees, participants, and clinical faculty and will help sustain CSTAR's high-quality simulation education programming.

In addition to its specialties in education programming, CSTAR's strengths also lie in the collaborative research its members are undertaking to advance surgical education and patient care.

First, CSTAR has created a research group focused on advancing health care simulation initiatives. The CSTAR Simulation Research Group is among the first of its kind in Canada

to identify and share best practices in simulation technologies and team based training to improve surgical and other technically based training technologies.

In Canada, the Canadian Patient Safety Institute (CPSI) acknowledges simulation training as a major determinant of safe clinical practice and is launching the Canadian Network for Simulation in Healthcare (CNSH) in 2009. LHSC, Schulich, and CSTAR are collaborating closely with CPSI and others in establishing the CNSH, which will link and support simulation education programs, resources, and experts from across Canada.

CSTAR is also collaborating with The Schulich School of Medicine & Dentistry's Centre for Educational Scholarship and Innovation to embark on a path of scholarly surgical education inquiry. Education researchers affiliated with this Center work with clinical academics and members at CSTAR to identify and share best practices in team-based surgical skills assessment, acquisition, and maintenance of competency.

Innovative research and education programming also require input from our industry partners. CSTAR has developed a semiannual Industry Round Table to identify and prepare for current and upcoming simulation education and research opportunities. Currently, 24 representatives attend the round table event, representing companies in the medical device, information technology, and simulation industries.

LEARNERS TARGETED

Type of Learner Served

CSTAR develops, delivers, and evaluates simulation education programs for two learner groups: medical students/trainees and working surgical professionals.

For medical students and trainees, required surgical procedural skills are determined by accredited curricula for medical schools in Canada as established by the Association of Faculties of Medicine of Canada (AFMC) and the Committee on the Accreditation of Canadian Medical Schools (CACMS). Both the AFMC and CACMS collaborate closely with the United States-based Liaison Committee on Medical Education in establishing accredited curricula.

CSTAR works closely with the Department of Surgery at the Schulich Medical School to establish and deliver skills-based programming for medical students and trainees that meet or exceed these standards. Approximately 75% of CSTAR student and training simulation education programming is developed for Schulich students, whereas 25% of programming serves the learning needs of students and trainees from across Canada.

For working surgical professionals, CSTAR's CME programming meets and exceeds accreditation benchmarks established by the Royal College of Physicians and Surgeons of Canada (RCPSC). All CSTAR Simulation CME programming is accredited by the RCPSC, through the accreditation services of Schulich's CME Office. More specifically, all CSTAR simula-

tion CME programming meets and exceeds the RCPSC's Maintenance of Certification criteria and its more recently developed Canmeds (Canadian Medical Education Directions for Specialists) competency-based framework in addition to criteria applicable within the province of Quebec as established by the Conseil de l'Éducation Médicale Continue du Québec, Collège des Médecins du Québec.

CSTAR simulation CME programming is accessed equally by regional, national, and international health care professionals with diverse subspecialty interests. CSTAR develops accredited, team-based simulation CME programming for surgeons, anesthesiologists, anatomists, imaging specialists, nurses, and other allied health care professionals.

Description of Courses

CSTAR provides approximately 150 simulation education activities and programs for Schulich medical students and trainees per year. For example, the Schulich Department of Surgery PGY1 Introductory Surgery Course is designed for first-year surgical residents in cardiac surgery, general surgery, orthopedic surgery, plastic surgery, urology, otolaryngology, obstetrics/gynecology and neurosurgery. The course outline includes technical skills training (knot tying, suturing, casting, basic AO, laparotomy/open, laparoscopic surgery, thoracic surgery, and vascular surgery), ATLS certification, an introduction to basic science, an anatomy review and principles of surgery seminars. Each skill is taught using appropriate low- to high-fidelity simulators.

CSTAR also offers a program in partnership with the Department of Anesthesiology and Perioperative Medicine at the Schulich School of Medicine & Dentistry and has a substantial track record in multidisciplinary training in critical event management. In 2007 through 2008, this program provided more than 200 residents, staff nurses, and respiratory therapists access to high-fidelity, scenario-based simulations including pneumonectomy with cardiac herniation and trauma-related cardiac tamponade.

For the past 2 seasons, CSTAR has also offered the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) annual basic endoscopy and laparoscopy workshop for second- and third-year residents. The SAGES program is well recognized and composed of a combination of didactic sessions and hands-on, mentor-guided animal laboratories. CSTAR is home to the only resident program SAGES offers outside the United States.

For working professionals, CSTAR offers accredited simulation CME programs in endourology, otolaryngology, neurology, thoracic, facial reconstruction and orthopedic surgery. CSTAR also offers team-based simulated CME programming in image-guided regional anesthesia (anesthesiology, anatomy, and orthopedic surgery), transcatheter valve replacement (anesthesiology, operating room nursing, cardiology, imaging, and cardiovascular surgery), and video-assisted thoracic surgery (anesthesiology, operating room nursing, and thoracic surgery).

Courses developed for working professionals are offered 10-15 times per year.

Types of Learners from Outside the Institution

CSTAR frequently invites learners from outside the organization to participate in its simulation education programming. For example, CSTAR's annual Video-Assisted Thoracic Surgery Update includes residents from every thoracic surgery program in Canada, whereas CSTAR's Image-Guided Regional Anesthesia Update includes multidisciplinary participants from 4 continents.

Operating room teams that require training seek out CSTAR's team-based simulation education programming capacity to meet this need. In 2009, CSTAR developed a 2-day, team-based robotic mitral valve repair simulation program for the cardiovascular surgery team of Montreal Heart Institute, Montreal, Quebec. Increasingly, CSTAR is recognized as a national and international destination of choice for simulation education programming.

SPECIAL FEATURES

Equipment and Unique Teaching Methods

CSTAR uses a variety of devices in its simulation education programming. These include airway, prostate, urology, inguinal hernia, anesthesia, anatomic forms and endoscopic simulators. In addition, CSTAR has validated, used, or developed several urologic, skull base, and cardiovascular surgery virtual reality simulators. In addition, CSTAR can support animal- and cadaver-based simulation programming through its acute laboratory and its soon-to-be-completed Brent and Marilyn Kelman Centre for Advanced Learning (Fig. 2).

CSTAR provides a completely wireless environment throughout its entire facility, interactive audio/video links to London's operating room suites, and a television studio-grade multimedia center with 3-dimensional, stereo-optic projectors (Fig. 3).

CSTAR's simulation equipment and information technology infrastructure and capacity support a wide variety of teach-



FIGURE 2. CSTAR's acute laboratory.



FIGURE 3. CSTAR's multimedia theater.

ing and training technologies, which include live, interactive surgery demonstrations with local, national and international centers, 3-dimensional demonstrations of robotic surgery and advanced imaging applications, telementoring and digital capture of all simulation education programming offered at CSTAR.

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