Annual Report

April 2021 –March 2022

CSTAR

Canadian Surgical Technologies and Advanced Robotics
London Health Sciences Centre

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Message from the Directors

As 2021-22 winds down and we prepare for the next year, this is an important moment, for us at CSTAR, to look both into the past and into the future. While the COVID-19 pandemic is not yet over, activities are beginning to return to normal. How we have weathered the storm reinforces the confidence we have in our outstanding team and builds excitement for the coming year.

Just as we put the finishing touches on our simulation centre accreditation by the Royal College of Physicians and Surgeons, we are applying for our fourth cycle of reaccreditation as an Accredited Education Institute of the American College of Surgeons, a distinction we have held since 2009.

As you will see in these pages, while navigating the health and safety restrictions imposed by the pandemic, CSTAR was able to maintain our service and commitment to our learners through the collaborative development and delivery of virtual training opportunities. These innovations will continue to remain a part of our fabric and ongoing development, even as we look forward to welcoming learners back to CSTAR for an outstanding in-person, hands-on, training experience.

Our research program will be back up and running with a renewed focus on developing computer assisted technology for simulation training and therapeutic intervention. The application of artificial intelligence and virtual reality will figure prominently in these innovations.

Finally, the excellent team at CSTAR continues to grow to meet our clients' needs. We welcome the following new members to our team: Lauren Maharaj, Shay Ford and Rihab Taleb. We are going to roll up our sleeves and continue to work diligently to bring our clients the very best service in the country.

Dr. Christopher Schlachta
Education Institute Surgical Director,
Medical Director

Andrew Mes
Interim Digital Health Executive & Chief Information Officer

Vision

CSTAR will be a leading, internationally recognized centre for healthcare innovation.

Mission

CSTAR improves the quality and safety of patient care by:

- Providing a safe environment for the development of health care providers with a focus on interprofessional education, simulation and training
- Advancing research into computer assisted surgical technology through the application of robotics and artificial intelligence
- Building value through collaborative development and delivery of accredited simulation programming

CSTAR Directory

CSTAR Team Member	Position
Andrew Mes	Interim Digital Health Executive and Chief Information Officer
Dr. Christopher Schlachta	Education Institute Surgical Director, Medical Director
Dr. Rajni Patel	Director of Engineering
Stephanie Ayres	Manager CSTAR
Scott Sumpter	Simulation Technical Consultant
Rihab Taleb	Simulation Technical Assistant
Rachel Daniels	Surgical Suite Facilitator
Karen Siroen	Surgical Suite Associate
Lauren Maharaj	Project Facilitator
Meghan Lightfoot	Project Associate
Shay Ford	Administrative Assistant
Alexis Goble	Surgical Suite Assistant
Ashley Cooke	Surgical Suite Assistant

CSTAR Education Committees

At CSTAR there are two (2) oversight committees comprised of subject matter experts, instructors, learners and members of the CSTAR team as follows:

1. **Education Oversight Committee** - provides guidance and governance in support of CSTAR achieving its mission. The Oversight Committee reviews activities and financial performance, identifies simulation/ training opportunities that CSTAR can provide solutions for, and provides an effective view of the current market and what future directions are likely to be.

Education Oversight Committee Membership

Member Name	Position
Dr. Christopher Schlachta (Chair)	Education Institute Surgical Director/Medical Director, CSTAR, Site-Chief of Surgery, University Hospital
Dr. Richard Cherry	Associate Dean, Learning with Technology and Simulation, Consultant, Anesthesia
Dr. Mary Fotheringham	Simulation Director, Consultant, Emergency Medicine
Dr. Brent Lanting	Consultant, Orthopedic Surgery
Dr. Marie Eve Lebel	Simulation Lead, Consultant, Orthopedic Surgery
Dr. Robert Leeper	Consultant, Critical Care and General Surgery, In situ
Jason Gibson	Manager Respiratory Therapy
Terri MacDougall	Education Coordinator, Surgery
Ana Malbrecht	Educational Coordinator, Medicine
Sarah Smith	Manager, Nursing Professional Practice
Kayley Perfetto	Patient Safety Specialist
Dr. Julie Ann VanKoughnett	Program Director and Consultant, General Surgery
Dr. Jeffrey Yu	Consultant, General Internal Medicine
Andrew Mes	Interim Digital Health Executive and Chief Information Officer
Stephanie Ayres	Education Institute Director/ Manager, CSTAR
Lauren Maharaj	Project Facilitator, CSTAR

CSTAR Education Committees Continued

2. Quality and Educational Excellence Subcommittee - introduced in January 2021 this committee's focus is on identifying strategies for improvement of CSTAR programs.

Quality and Educational Excellence Subcommittee

Member Name	Position
Camilo Jaramillo	Clinical Educator UH Emergency Department
Elizabeth McGowan	Clinical Educator UH Perioperative Unit
Ian Dashnay	Clinical Educator Intensive Care Unit
Leanne Scott	Clinical Educator General Surgery
Rebecca Park	Clinical Educator CCTC
Dr. Sonja Payne	Consultant, Anesthesia
Tim Winterburn	Respiratory Therapist
Stephanie Ayres	Education Institute Director/ Manager, CSTAR
Lauren Maharaj	Project Facilitator, CSTAR

CSTAR Accreditation

Royal College of Physicians and Surgeons of Canada (RCPSC) - Re-Accreditation

CSTAR has been accredited with the RCPSC since 1st January 2017. Based on the review of the 2021 Accreditation submission CSTAR was granted 3-year Accreditation status beginning January 2022. The next step is the submission of an action plan to highlight the proposed activities and initiatives undertaken to address the partially compliant standards. In December 2022 CSTAR will submit an Interim report highlighting the advances made in addressing the areas of partial compliance. It is expected that CSTAR will be granted full 5-year accreditation based on the improvements.

American College of Surgeons (ACS) – Re-Accreditation

CSTAR has been accredited with the American College of Surgeons since January 1, 2009 and is seeking re-accreditation for 2023. The ACS made significant revisions to their accreditation standards in November 2021 and CSTAR is in the process of compiling information for the re-accreditation application due in July 2022.

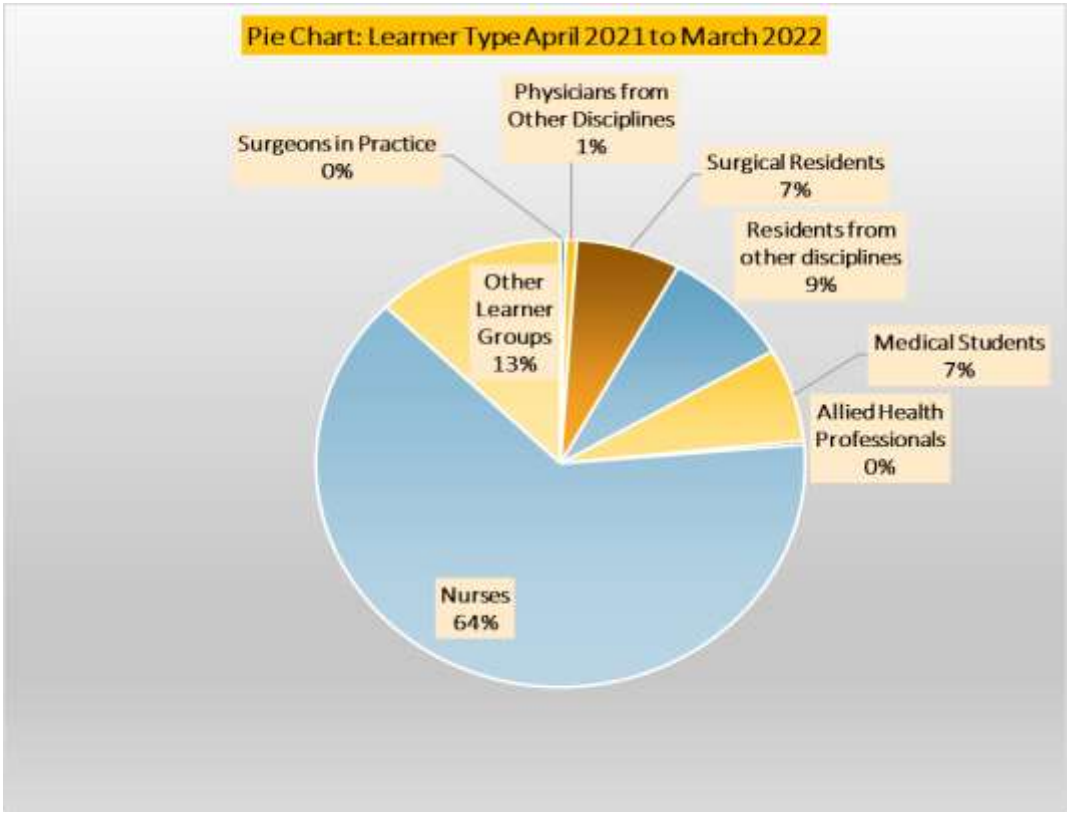
We appreciate the help of everyone who supports CSTAR in maintaining our Accreditation status!

CSTAR Operations

The COVID-19 pandemic impacted the operations at CSTAR due to the Infection Prevention and Control restrictions, implemented throughout LHSC facilities, to curb the spread of the virus. For the last fiscal period CSTAR was, once again, required to be flexible and adaptable relying on the development and implementation of virtual learning options.

As restrictions began lifting in a limited capacity, the staff at CSTAR explored scheduling options for learners to maximize on in-person learning opportunities where possible. For the last fiscal period 6,501 learners were accommodated via in-person or virtual programs. When analyzed by category of staff, nurses accounted for 64% of all learners, followed by other learner groups 13%, residents from other disciplines 9% and surgical residents and medical students accounting for 7% respectively as seen in Figure 2 below:

Figure 2: Percentage of Learners accessing services at CSTAR by Category

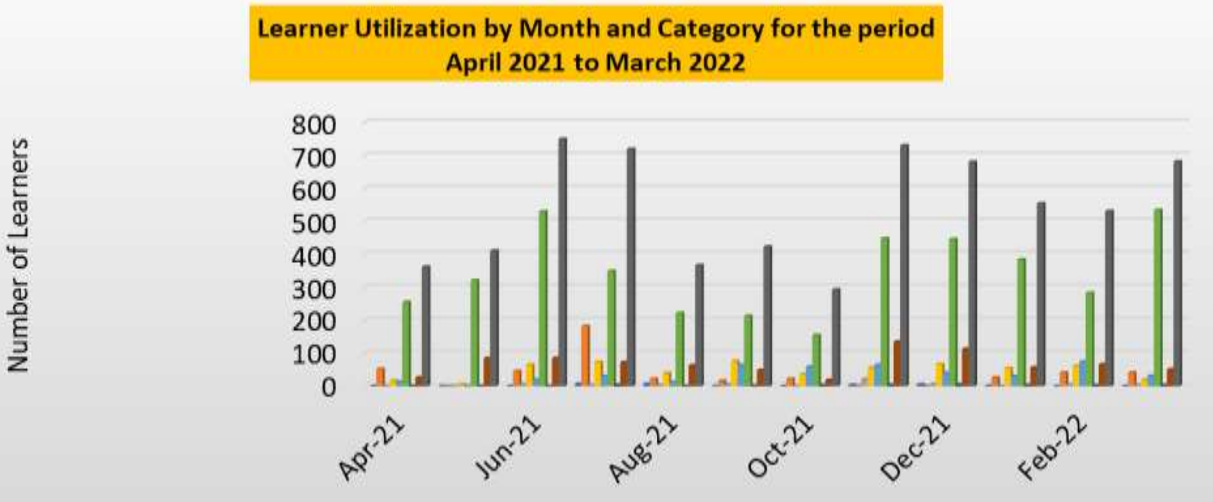


CSTAR Utilization

CSTAR Utilization by Month

When examining CSTAR monthly utilization, the months of June and November 2021 accommodated the most learners followed by December 2021 and March 2022. See Figure 3:

Figure 3: CSTAR Learner Utilization by Month



	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Surgeons in Practice	0	0	0	7	7	0	0	3	5	1	0	0
Surgical Residents	52	0	46	182	22	16	22	1	0	26	41	41
Physicians from other Disciplines	0	0	5	2	2	4	0	21	6	0	4	3
Residents & Fellows other Disciplines	16	5	64	73	39	76	36	55	66	54	61	19
Medical Students	13	0	20	30	12	64	59	64	40	30	74	31
Nurses	255	321	530	349	222	213	155	448	446	384	283	534
Allied Health Professionals	0	0	0	3	0	1	2	3	4	2	2	2
Others	26	85	85	73	63	49	19	135	113	57	66	51
TOTAL	362	411	750	719	367	423	293	730	680	554	531	681

Central Nursing and Personal Support Worker Orientation

Orientation of newly hired LHSC Staff

Prior to the COVID-19 pandemic LHSC conducted a comprehensive hiring and orientation process for nurses and other new hires. Nursing onboarding and orientation included several components such as:

1. A simulation-based interview where a physical assessment of a “patient” was completed, and critical thinking skills applied. Subjects would report their findings to a physician and make recommendations for nursing care, such as would occur in the workplace,.

2. Corporate Nursing Orientation (CNO) consisting of one (1) day of computer training and three (3) days of hands on and didactic training at CSTAR

3. Department specific orientation which varied in length and delivery method based on the area that the staff was assigned.

Personal Support Workers had a similar process which included:

1. An in-person interview with simulation

2. A combination of didactic and hands on training with some stations shared with nursing.

For the past two years the interview and orientation have been delivered virtually for nurses. For PSWs, while their orientation is remains primarily virtual, they have gone back to an in-person interview,.

For the last fiscal period CSTAR has worked to facilitate virtual orientation and onboarding for new nursing, PSW and other hires where applicable. CSTAR staff, clinical educators and other administrative personnel have combined efforts to review and update training materials, create training videos and develop a schedule that contains material that is both applicable and engaging.

For the next fiscal period CSTAR has engaged all parties to conduct a Needs Assessment of the program to ensure that learner needs are being met and that program evaluation and improvement occurs. We are looking to explore all options for improving the learner experience, including the development of a hybrid training model, pending the lifting of COVID-19 restrictions in the future.

CELEBRATING SUCCESS

Advanced Surgical Skills for Exposure in Trauma (ASSET) Course

ASSET™

ADVANCED SURGICAL SKILLS FOR EXPOSURE IN TRAUMA

The Advanced Surgical Skills for Exposure in Trauma (ASSET) course was offered at CSTAR for the 5th time on 25th June 2021. The course provides an overview of surgical trauma exposures in five (5) key anatomic areas: neck, chest, abdomen and pelvis, and upper and lower extremities. The one-day cadaver-based course followed a modular, body region approach. Each section began with a short, case-based overview, followed by a hands-on exposure performed by students under the guidance of faculty.

The student-to-faculty ratio was low, allowing extensive faculty guidance and interaction with students. The students had an opportunity to assess their ability to perform each exposure independently and were evaluated on knowledge and technical skills. The participants for this course included mid-level and senior surgical residents, trauma and acute care surgical fellows, and surgeons interested in reviewing specific anatomy.

Learners walked away with knowledge of key anatomical exposures for the care of injured and acutely ill surgical patients. They were able to demonstrate their technical ability to expose critical anatomy that may require life or limb sparing acute surgical intervention Learners were provided with feedback via faculty assessment of their ability to independently achieve anatomical exposures.

Surgical Foundations at CSTAR

Since 2009, the Surgical Foundations program has been offered at CSTAR with an average of thirty (30) participants annually. Over the last two (2) years, due to the restrictions of the COVID-19 pandemic, we had to cancel many of our in-person scheduled programs. Recognizing that the opportunity for hands on practice is a necessary, valuable, component of training for PGY1 residents or "surgical interns", CSTAR staff worked together with the team from the Surgical Residency Training Program to identify creative opportunities to offer the program within the Infection Prevention and Control and Occupational Health and Safety Guidelines. During the last fiscal year CSTAR conducted multiple training sessions for residents where they were able to get valuable hands-on practice in the simulation lab. Programs were conducted as follows:

"Surgical Interns" participating in the Surgical Foundations Bootcamp

- April 7th 2021 - one Bootcamp session was held to replace a cancelled session from July 2020 that had to be rescheduled due to COVID shutdown
- April 14th 2021 - Suturing course was held to replace a cancelled session from 2020
- Two Bootcamps were delivered from 5-9th and 12-14th July 2021 for Post Graduate Year one (PGY-1) residents.
- Dr. VanKoughnett conducted skills testing for PGY-2 Residents on 22nd September 2021. For this session two central venous line stations were set up in the Kirkley Meeting room and residents were evaluated on their techniques and skills.
- On 6th October 2021 a PGY-3,4 Surgery Academic Half-Day was scheduled. At this session Box trainers were set up in the laboratory and PGY-4 residents had the opportunity to train PGY-3 residents at floors 6 and 8 of CSTAR.
- January 2022 signaled the return of the Surgical Foundations Bootcamp with complete in person program offerings. PGY-1 residents participated in Principles of Surgery (POS) training sessions on the following dates: January 26th, February 9th and 16th and March 9th, 23rd, and 30th

Western Emergency Medicine Airway Course

In June and December 2021 CSTAR hosted the Western Emergency Medicine Airway Course. The ED airway course is a mandatory education session for residents and fulfills the competency-based expectations for learners. Airway management is a crucial aspect of emergency care and is a required skill for emergency and anesthesia. The airway course is delivered as a combination of didactic and skills-based learning and it is the only dedicated airway teaching that the emergency residents get during their training.

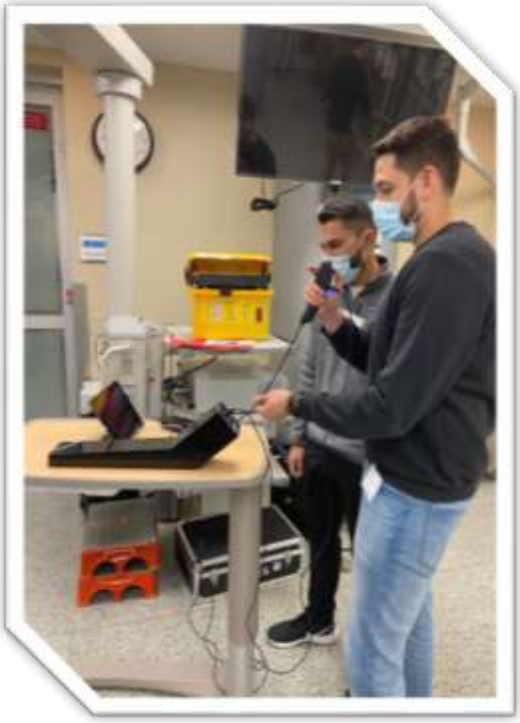
Normally the skills-based component is carried out in person using task trainers, however, the June 2021 course offering was moved to virtual to meet COVID-19 restrictions. Feedback from learners was positive, however the benefit of hands-on skill-based training was well recognized. In December they were fortunate to be able to host the course in-person with small groups of participants rotating through multiple hands-on skills and simulation stations. Participants expressed that all of the content was valuable and, despite it being a long day, they would have liked even more time at some of the skills stations. Plans are already in place to host the program in December 2022!

"The Western Emergency Medicine Airway Program was happy to bring our annual Emergency Airway Course back to CSTAR. The administrative team at CSTAR helped plan and execute our course to an exceptionally high level, bringing together members of Anesthesia and Emergency Medicine to collaborate on such essential knowledge and skills. This course has traditionally been the highest-rated educational day our residents participate in and that trend continued in 2021. We look forward to hosting our learners at CSTAR once again in upcoming years."

WestERn Airway

Western Emergency Medicine Airway Course Continued

Direct Video Laryngoscopy



Hands on Learning with Intubation Simulator Prototype

Fiberoptic Intubation

Innovations in Virtual Communication

In spring of 2021, CSTAR was contacted by industry representatives to host a lab to get feedback from local surgeons on the use of new equipment for conducting hip surgery. The challenge presented was that part of the team looking for feedback was in the United Kingdom and due to COVID restrictions, was not able to travel to London, Ontario Canada to observe the surgery, respond to questions and gather the relevant feedback.

Our Simulation Technical Consultant was able to set up two-way communication and cameras with multiple views that allowed the participants to share information, and view the procedure in real-time, including fluoroscopy images. The event showcased our ability to innovate and move forward despite the restrictions of the pandemic.

NEW INITIATIVES 2021-2022

Regional Rural Trauma Skills Training

Dr. Rob Leeper, CSTAR and the Trauma Program collaborated to deliver a trauma skills training session at Stratford General Hospital. The inaugural half-day program focused on cricothyroidotomies and chest tube insertions, starting with a video demonstration of both procedures followed by an opportunity for all learners to practice the skills using task trainers with feedback from the instructors. Sixteen Emergency Physicians from St. Mary's, Seaforth and Stratford General Hospitals attended the program.

Procedures practiced were cricothyroidotomies using the bougie and Seldinger technique, ultrasound guided pigtail chest tubes and large-bore chest tubes. Instructors provided many tips and tricks to enhance the learning, including how to tape the chest tube for transport and how to suture it in so it doesn't dislodge, what angles to insert it in, how large a hole to cut, how to deal with bleeding during the procedure and strategies to calm yourself in a hectic scenario.

Learners reported increased confidence in dealing with emergency situations and appreciated the practical experience with real-time feedback from instructors.

Collaboration for Virtual Learning Projects

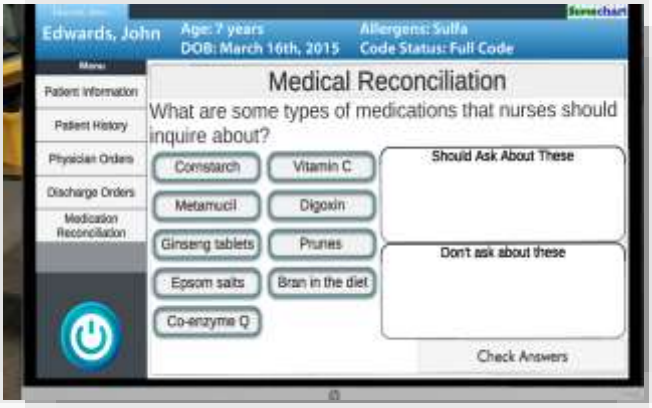
CSTAR collaborated on three projects funded as part of the eCampus Ontario Virtual Learning Strategy intended to drive growth and advancement in virtual learning across the province's post-secondary institutions.

1. Virtual Escape Room for Nursing Students –Supporting a Culture of Safety

Fanshawe College School of Nursing and CSTAR partnered to design a virtual simulation experience in the form of an escape room aimed at promoting a culture of safety for nursing students. Four unique scenarios were created using puzzles and problems to challenge the learners' theoretical knowledge, application of clinical reasoning, and nursing skill intervention. To achieve freedom from the Escape Room, the learners need to maneuver through the safety considerations correctly and determine the best course of action based on professional standards of practice.

The virtual Escape Room will be used in nursing curriculum to augment face-to-face learning to address a variety of learning styles and provide accessibility of online learning. The virtual simulation will also provide continuous access to support the learner's review and their life-long learning as they prepare for the role of regulated professionals

For links to the 4 scenarios visit the CSTAR webpage [CSTAR Projects Client Safety Escape Rooms | LHSC]



Collaboration for Virtual Learning Projects (cont.)

2. Embedding Virtual Simulation, Virtual Reality & Augmented Reality in Education: An Educator's Toolkit

CSTAR was one of several academic and clinical partners who collaborated on a project led by Centennial College, to develop an interactive, online textbook for faculty transitioning to virtual simulation, to understand the nuances related to the pre-brief, the enactment, and the debrief.

This open access e-textbook https://ecampusontario.pressbooks.pub/vlsvstoolkit/ was developed as a resource to help educators and simulationists use virtual simulations with learners in all educational settings. It is designed to highlight key concepts related to educator preparation, pre-brief, enactment, debrief and evaluation stages required for providing an effective virtual simulation learning experience. The foundational information in this e-textbook will benefit any educator who is using virtual simulation in a course, lab, clinical setting or to augment clinical practice.

3. Gamified Simulation Training for Faculty Development

CSTAR collaborated with Continuing Professional Development, Schulich School of Medicine & Dentistry, Western University (CPD) and the Healthing Media Group to develop a serious game to motivate and educate faculty on how to develop effective simulation scenarios for a broad range of simulation activities.

Designed to be delivered through a learning management system, two scenarios were developed where faculty make decisions on various components of simulation design and receive real-time feedback on their decisions as they progress through the game. Their final score can be compared to their peers through the leaderboard,. This serious game can be accessed through Schulich's learning system for faculty development.

UPCOMING PROJECTS 2022-2023

UGE Transition to Clerkship Simulation Sessions

In May 2022, CSTAR will host the simulation components of the UGE Transition to Clerkship program offered by the Undergraduate Medical Education program at Schulich School of Medicine and Dentistry. The course organizers approached CSTAR as they were looking to increase the simulation components of this annual course and needed to accommodate a large group of learners. We collaborated to design a series of stations to accommodate two sessions of 65 students divided into groups of 6-7.

The simulation sessions are designed to help students prepare for clerkship and specifically become more confident in the Emergency Care and Surgical Care settings.

The Emergency Care Simulation will be comprised of five stations as follows:

1. Oxygen Delivery
2. Basic Airway
3. CPR
4. Defibrillator and ECG
5. Spot Diagnosis and approach to imaging

The Surgical Care Simulation will also be comprised of five stations, namely:

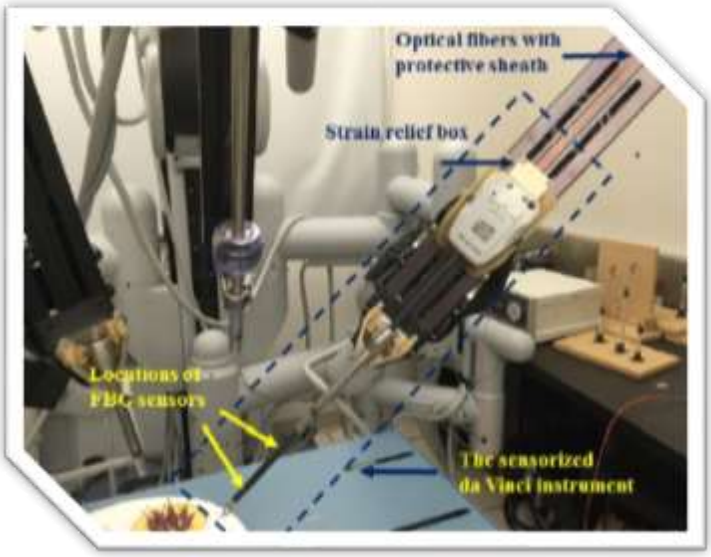
1. IV Insertion
2. Simple Suturing
3. Knot Tying
4. Simple Procedures
5. Donning and Doffing for Ward and Operating Room

It is our hope that this will become an annual event at CSTAR with more opportunities to grow the simulation components.

CSTAR RESEARCH

Dr. Patel Honoured

- Rajni Patel, CSTAR Director of Engineering, received the IEEE Canada McNaughton Award. IEEE Canada remembers, through the A.G.L. McNaughton Gold Medal, General McNaughton's contributions to the engineering profession in Canada. Recipients of this medal are outstanding Canadian engineers recognized for their exemplary contributions to the engineering profession. In April 2021, Dr. Patel received this award in recognition of his "exemplary contributions to the engineering profession" and "for outstanding contributions to robotics, control systems, haptics and teleoperations and their practical applications". The photos below highlight his research conducted at CSTAR. The CSTAR team and faculty congratulates Dr. Patel on achieving this distinguished award!



Sensorization of da Vinci instruments for force sensing using Fibre-Bragging grating (FBG)

Rajini Patel
Director of Engineering CSTAR

A.G.L Mc Naughton Gold Medal

Leader-follower teleoperation for haptics-enabled robotics assisted surgery

CSTAR Research - Publications

Publications:

1. Asbun HJ, Abu Hilal M, Kunzler F, Asbun D, Bonjer J, Conlon K, Demartines N, Feldman LS, Morales-Conde S, Pietrabissa A, Pryor AD, Schlachta CM, Sylla P, Targarona EM, Agra Y, Besselink MG, Callery M, Cleary SP, De La Cruz L, Eckert P, Evans C, Han HS, Jones DB, Gan TJ, Koch D, Lillemoe KD, Lomanto D, Marks J, Matthews B, Mellinger J, Melvin WS, Moreno-Paquentin E, Navarrete C, Pawlik TM, Pessaux P, Ricciardi W, Schwaitzberg S, Shah P, Szokol J, Talamini M, Torres R, Triboldi A, Udomsawaengsup S, Valsecchi F, Vauthey JN, Wallace M, Wexner SD, Zinner M, Francis N. International delphi expert consensus on safe return to surgical and endoscopic practice: From the Coronavirus global surgical collaborative. Annals of Surgery. 2021 July:274(1);50-6

2. Pang G, Kwong M, Schlachta CM, Alkhamesi NA, Hawel JD, Elnahas AI. Safety of same day discharge in high-risk patients undergoing ambulatory general surgery. Journal of Surgical Research. 2021 July;263:71-7

3. McGillion MH, Parlow J, Borges FK, Marcucci M, Jacka M, Adili A, Lalu MM, Ouellette C, Bird M, Ofori S, Roshanov PS, Patel A, Yang H, O'Leary S, Tandon V, Hamilton GM, Mrkobrada M, Conen D, Harvey V, Lounsbury J, Mian R, Bangdiwala SI, Arellano R, Scott T, Guyatt GH, Gao P, Graham M, Nenshi R, Forster AJ, Nagappa M, Levesque K, Marosi K, Chaudhry S, Haider S, Deuchar L, LeBlanc B, McCartney CJL, Schemitsch EH, Vincent J, Pettit SM, DuMerton D, Paulin AD, Simunovic M, Williams DC, Halman S, Harlock J, Meyer RM, Taylor DA, Shanthanna H, Schlachta CM, Parry N, Pichora DR, Yousuf H, Peter E, Lamy A, Petch J, Moloo H, Sehmbi H, Waggott M, Shelley J, Belley-Cote EP, Devereaux PJ;PVC-RAM-1 Investigators. Post-discharge after surgery Virtual Care with Remote Automated Monitoring-1 (PVC-RAM-1) technology versus standard care: randomized controlled trial. British Medical Journal. 2021 Sep 30;374:n2209

4. Alsowaina KN, Atashzar SF, Pur DR, Eagleson R, Patel RV, Elnahas AI, Hawel JD, Alkhamesi NA, Schlachta CM. Video context improves performance in identifying operative planes on static surgical images. Journal of Surgical Education. October 23, 2021. Online publication.

5. Gupta A, Gupta, E, Hilsden R, Hawel JD, Elnahas AI, Schlachta CM, Alkhamesi NA. Preoperative malnutrition in colorectal cancer patients. Canadian Journal of Surgery. November 1, 2021. Online Publication

6. Elnahas AI, Doumouras AG, Anvari M, Schlachta CM, McClure A, Alkhamesi NA, Hawel JD, Urbach DR. Access to bariatric surgery among older patients in a publicly funded regionalized care system. Surgical Endoscopy. 2021 Dec;35(12):6990-6997.

7. Nagappa M, Querney J, Martin J, John-Baptiste A, Subramani Y, Lanting B, Schlachta C, Von Koughnett JA, Speechley K, Correa J, Yunus Chohan MB, Rrafshi N, Batohi M, Fayad A, Yang H. Perioperative Satisfaction and Health Economic Questionnaires in Patients Undergoing an Elective Hip and Knee Arthroplasty: A Prospective Observational Cohort Study. Anesthesia Essays Research. 2021 Oct-Dec;15(4):413-438.

CSTAR Research – Publications Continued

Publications continued

8. Glass LT, Schlachta CM, Hawel JD, Elnahas AI, Alkhamesi NA. Cross-border healthcare: A review and applicability to North America during COVID-19. Health Policy Open. 2022;Jan 10. Online publication

9. Elnahas A, Reid JN, Lam M, Schlachta CM, Doumouras AG, Anvari M, Urbach D. Risk Factors for Abdominal Reoperation in Bariatric Patients for Obesity and Related Diseases. Surgery for Obesity and Related Diseases. 2022 Feb;18(2):233-240

10. Liu RQ, Elnahas A, Tang E, Alkhamesi NA, Hawel J, Alnumay A, Schlachta CM. Cost analysis of indocyanine green fluorescence angiography for prevention of anastomotic leakage in colorectal surgery. Surgical Endoscopy. March 15, 2022. Online publication

11. N. Feizi, R.V. Patel, M.R. Kermani, S.F. Atashzar, “Adaptive Wave Reconstruction through Regulated-BMFLC for Transparency-enhanced Telerobotics over Delayed Networks," IEEE Transactions on Robotics, pp.1-15, 2022; https://doi.org/10.1109/TRO.2022.3158195.

12. A. Usova A, K.A. Pachkouski, I. Polushin, R.V. Patel, Stabilization of Robot-Environment Interaction Through Generalized Scattering Techniques,” IEEE Transactions on Robotics, vol. 38, no. 2, pp. 1319-1333, 2022. https://doi.org/10.1109/TRO.2021.3107231.

13. Y.K. Tamilselvam, J. Ganguly, R.V. Patel, M. Jog, “Musculoskeletal Model to Predict Muscle Activity During Upper Limb Movement,” IEEE Access, vol. 9, pp. 111472 – 111485, 2021. https://doi.org/10.1109/ACCESS.2021.3103438.

14. M. Bernardinis, S.F. Atashzar, R.V. Patel, M.S. Jog. “Abnormal Vision-Based Displacement Perception in Parkinson’s Disease,” Frontiers in Neuroscience, 15(676469): 1-10, 2021. https://doi.org/10.3389/fnins.2021.676469.

15. S. Shahtalebi, S.F. Atashzar, R.V. Patel, M.S. Jog and A. Mohammadi, “Deep Explainable Artificial Intelligent Framework for Neurological Disorders Discrimination,” Nature: Scientific Reports. (2021), 11:9630; 18 pages. https://doi.org/10.1038/s41598-021-88919-9.

16. N. Feizi, M. Tavakoli, R.V. Patel, S.F. Atashzar, “Robotics and AI for Teleoperation, Tele-Assessment, and Tele-Training for Surgery in the Era of COVID-19: Existing Challenges, and Future Vision,” Frontiers in Robotics and AI, 2021, vol. 8, article 610677

17. Pre-operative stenting and complications following pancreatoduodenectomy for pancreatic cancer: an analysis of the ACS-NSQIP registry. Garcia-Ochoa C, McArthur E, Skaro A, Leslie K, Hawel J. Surg Endosc. 2021 Dec;35(12):6604-6611. doi: 10.1007/s00464-020-08160-9. Epub 2020 Nov 25.

CSTAR Research – Conference Papers, Presentations

Conference Papers

1. A. Shamsil, M.D. Naish, R.V. Patel, “Texture-Based Intraoperative Image Guidance for Tumor Localization in Minimally Invasive Surgery,” 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS), Oct. 31 – Nov.4, 2021. https://doi.org/10.1109/EMBC46164.2021.9629758.
2. N. Feizi, S. Thudi, R.V. Patel, S.F. Atashzar, “Time-Domain Passivity-Based Controller with an Optimal Two-Channel Lawrence Telerobotic Architecture," *2021 IEEE Robotics and Automation Conference (ICRA2021)*, Xi’an, China, May 31 – June 4, 2021. https://doi.org/10.1109/ICRA48506.2021.9561930.

Presentations

1. Schlachta CM. Reimagining the OR in Presidential Plenary: Reimaging the Practice of Surgery. Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) 2021. Las Vegas, NV. September 2, 2021
2. Schlachta CM. I Have a Great Idea, Now What? in Current State of Surgical Technology. Women’s Leadership in Surgery Virtual Conference. September 26, 2021
3. Schlachta CM. Surgical Education and Training in the Era of Telemedicine in Telemedicine in Surgery: What’s New. Clinical Congress of the American College of Surgeons - Virtual. October 26, 2021

Impact of COVID-19 on Research in the Engineering Lab at CSTAR

The restrictions imposed on access to the research labs at CSTAR, have affected research productivity to some extent. Much of the research work in the Engineering group at CSTAR is based on the use or development of advanced robotic and other equipment at CSTAR and collaboration involving engineering and clinical researchers. Physical presence in the lab is therefore important. The situation improved over the last few months of F2022 since all the researchers in the Engineering group have received their vaccinations. As far as possible, research meetings have been conducted via Zoom.

CSTAR Research – Funded Research Projects

Current Funded Research Projects (2020-2021)

1. R.V. Patel (PI), C.M. Schlachta, and J. Hawel, , Intuitive Surgical Technology Grant: *Design, Evaluation and Validation of a Novel Sensorized Training Colonoscopy Device*, 2020-2022.

The goal of this project is to develop a force sensorized sleeve for a colonoscope for real-time feedback of force transmission along its entire length and use of the information together with position profiles in a training and skills assessment system for colonoscopy.

2. J. Jagadeesan (PI, Harvard), R.V. Patel, and 3 others, National Institutes of Health (NIH, USA) – RO1: Academic-Industrial Partnerships for Translation of Medical Technologies: *Robot-Assisted 3D ICE Catheter for Cardiac Ablation*, 2020-2025.

The objective of this research is to develop a novel robotic manipulator, a steerable ICE (intracardiac echocardiography) catheter, and machine learning and control algorithms to manipulate the ICE catheter and monitor the created lesions in real-time.

3. J. Jagadeesan (PI, Harvard), R.V. Patel and D. Sacco, National Institutes of Health (USA), NIH-RO1: *Image-registered, Hand-held, Concentric Tube Robot for Percutaneous Treatment of Calculi*, 2019-2024.

The objective of this research is to develop robotic technology for the Percutaneous Nephrolithotomy (PCNL) procedure that can access the entire renal calculus through a single insertion port with accurate guidance and minimal complications.

4. R.V. Patel, NSERC Discovery Grant: *Design and Control of Robotic Systems and Devices for Medical Applications*, 2019-2024.

This research program is aimed at developing advanced robotic and intelligent systems for the next generation of minimally invasive medical interventions based on recent developments in continuum robotics, machine learning, and “smart” actuation and sensing technologies, coupled with advances in haptics and teleoperation.

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